The WebMark Course Management System

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Abstract

Academics frequently spend a large proportion of their time on administration tasks such as ensuring assignments are marked consistently and on schedule, collating and releasing results, and computing final results. This often leaves insufficient time for the deeper, educational aspects of delivering a course. Similarly, students are disadvantaged by late or inadequate feedback on their work.

In this paper, we discuss the need for effective course management tools, and introduce the WebMark tool to help academic staff administer the marking of assignments and collation of results. It supports web-based assignment marking, automated results mailout, computation of detailed statistics, and generation of end-of-semester course results. We believe that wider use of tools such as this will help reduce academic workloads while improving the student learning experience.

Keywords: Teaching software, educational software, online marking, course management

1 Introduction

There are several distinct tasks involved in successfully running a course: preparation and delivery of content, guiding students as they learn the material, and evaluation of assessments. The last item often involves ensuring consistent, on-schedule completion of marking, efficient and useful feedback, identification of students requiring additional help, and collation of individual assessment marks to calculate final results. For larger cohorts, this often consumes a large share of the course leader's time (Kay, 1998), and academics list them high among the difficulties in managing large classes (Herbert & Hannam, 2001).

Often, staff must contend with multiple data sources and tools. For example, assignment marking results may be received from tutors by email, entered into a spreadsheet, and results conveyed to students by email or published on an authenticated web page. In most cases, there is no central data store that provides live views of the data as marking proceeds. At the end of semester, the lecturer must collate all data to obtain a final result for each student. This may involve weighting the marks for different items and application of compulsory hurdles. Finally, borderline cases must be scrutinised, and adjustments made.

In this paper, we introduce the WebMark tool we have developed to streamline these tasks. In Section 2, we examine several existing tools, and describe the need for a better system. Section 3 provides an overview of the WebMark system. Sections 4, 5, 6, and 7 look at the Marking, Administration, Management, and Student interfaces respectively. We conclude with a summary of our discussion and directions for future work.

2 Related Work

Many academics employ computer-based tools to help administer courses, deliver content, and assess student performance. In particular, assessment tasks are often common to all students in a cohort, and require a set number of problems to be addressed. Marks are awarded for work that meets the marking requirements. This classic style of assessment permits the use of semi-automated approaches to improve the marking process.

In cases where students must choose answers from among multiple pre-defined choices, the marking process is straightforward and easily automated. Some computerised systems even support limited parsing of textual answers in search of required keywords. Systems offering various forms of automated marking include WebLearn (Fernandez, 2001), abc.test (Tores Software, n.d.), and Perception (QuestionMark Corporation, n.d.).

Educators generally aim to develop comprehension, critical thinking, and problem-solving skills. Unless carefully designed, multiple-choice tests and questions with simple keyword answers may instead encourage learning by rote (University of Oregon, 2002; TEDI, 2002). Hence, academics often require students to provide detailed free-text answers to questions, or ask them to develop practical solutions to specified problems. In such cases, students are frequently graded according to how well they meet pre-defined criteria. To evaluate the quality of student responses in this style of assessment, human involvement is essential, at least for the forseeable future.

Several software tools have been developed to aid human markers in this evaluation process. The most flexible of these is Mindtrail. This allows staff to construct a marking guide for each assessment and generate individualised feedback reports. The MindTrail company ceased trading in 2001, and the product is no longer available. MarkIt (Dingsdag et al., 2000) allows pre-defined comments to be reported to the student, along with statistics about where they fit among the student population. MarkIn (Creative Technology, n.d.) is a third marking program. It allows the import of textual submissions for annotation. The annotated text can then be exported as a file or emailed directly to the student (Creative Technology, n.d.). Similar systems worth noting include ASSYST (Jackson, 2000), BOSS (Joy & Luck, 1998), e-TMA (Thomas & Taylor, 2000), Grading Wizard (Preston & Shackelford, 1999), and WebCoDe (Mason et al., 1999). None of these tools combines distributed marking using a standard marking guide, live statistics, marks distribution, and calculation of overall results.

3 WebMark — Overview

WebMark is a tool designed to address some of difficulties outlined in the previous section. This is a centralised system for consistent assessment of assignments, tests, and exams, monitoring marking progress and marking statistics, distributing results to students, and compilation of end-of-semester results. WebMark has four main aspects. First, it is an online marking tool, allowing quick and consistent marking. Second, it is a course administration portal, from which the course administrator can view and manipulate information from different sources, such as enrolment information, assignment marking progress, and assessment results. Third, it is a results release system that allows students to view their results alongside the marking criteria. Fourth, it is a management tool that allows managers to gather information on marking progress across multiple courses. WebMark is not a submission system, although integration with existing submission tools is possible.

Being web-based, WebMark is accessible across all platforms, and requires only a standard JavaScript-capable web browser to operate. The system runs on a secure (SSL-enabled) web server, and users are granted privileges according to their access level.

At present, users may have a combination of five access levels:

Marker:

Markers are permitted to enter results for specified courses.

Administrator:

The course administrator controls the creation of a course, marking of assessments, and release of interim and final results. The administrator also creates accounts and assigns marker or administrator privileges to other course staff.

Manager:

Managers can view reports of assignment marking progress for all courses in the system.

Student:

If authorised by the course administrator, students can view their results on an authenticated web page, along with the marker's comments and the marking guide. Similarly, the final semester result can be published, indicating the mark for each assessable component of the course.

Root:

Users with root privileges are responsible for system maintenence; since this is mostly a technical, rather than educational aspect, we do not describe this role further in this paper.

Each course typically has administrator accounts for the lecturer and head tutor, and marking accounts for individual tutors. A user may different privileges for different courses. We continue with a detailed description of the associated primary interface for each access level.

4 Marking interface

When designing assignments and tests, instructors generally require specific goals to be met by the student. Students meet these requirements to varying degrees, and are awarded marks accordingly. To support the learning process, staff must provide the student with not only the quantitative result, but also a description of why marks were awarded or deducted in particular cases. The importance of constructive and timely feedback has been repeatedly

```
<?xml version="1.0" standalone="no"?>
<!DOCTYPE Configuration SYSTEM "http://webmark.cs.rmit.edu.au/Lib/module.dtd">
<Configuration>
  <Name>CS833 Assignment 1</Name>
  <Section>
    <Text>Part A</Text>
    <Question>
    <Text>Query form</Text>

      <Part Marks="2" StartWithFullMarks="false">
        <Text>Two-component query module</Text>
        <Comment Weight="2">
          <NoteToMarker>Component 1: query screen<br/>
                        Component 2: results screen.
          </NoteToMarker>
          <Text>You have correctly implemented two-component querying.</Text>
        </Comment>

        <Comment Weight="0">
          <Text>You have not correctly implemented two-component querying.</Text>
        </Comment>
      </Part>

      <Part Marks="2" StartWithFullMarks="true">
        <Text>Form submission method</Text>
        <Comment Weight="0">
          <NoteToMarker>The URL must have a query string once you submit the form.
                  Alternatively, check code for <tt>action="GET"</tt>.
          </NoteToMarker>
          <Text>You've correctly used the GET method.</Text>
        </Comment>

        <Comment Weight="-2">
          <Text>You should have used the GET method.</Text>
        </Comment>
      </Part>
    </Question>
  </Section>
</Configuration>
```

Figure 1: A short marking guide in the WebMark XML vocabulary.

emphasised by other educators (Arbuthnott et al., 1997; Flinders University, 2002; Ramsden, 1992). Freeman & Cappelletto (2002) also note that improper attention to student feedback can make an institution liable to litigation.

However, providing detailed comments for individual students is a time-consuming process. Since students often approach the problem in similar ways, or make the same mistakes, this can also be quite tedious. In addition, the computation of marks is open to error, and sometimes abused by students. For larger cohorts where multiple markers are involved, maintaining a uniform marking standard is a further concern (Kay, 1998).

We see value in using a computer-based checklist to structure our marking, award marks for each target met, and deduct marks for each common mistake. As each item is checked off the list, appropriate comments could be generated addressed to the student. Since there is no need to manually write the same text for each student, the comments can be quite detailed. An additional benefit is that there are no problems with illegible handwriting.

WebMark allows the marking criteria for each assessment component to be specified using an XML configuration file. A simple configuration file is shown in Fig. 1. The system dynamically generates a web-based marking form according to the configuration information. Fig. 2 shows the marking form generated from the configuration information of Fig. 1.

Here, the marker can select generic checklist items, or *comments*. As each comment is selected, appropriate marks are added or subtracted, and the associated text is appended to the marker's comments, Since the pre-defined comments will not be appropriate for all students, markers may also add free-form comments to each item explaining their choice of marks. A running total is maintained at the bottom of the form, rounded to the required precision, and incorporating any penalties for late submission. The overall mark for a part may be fine-tuned or

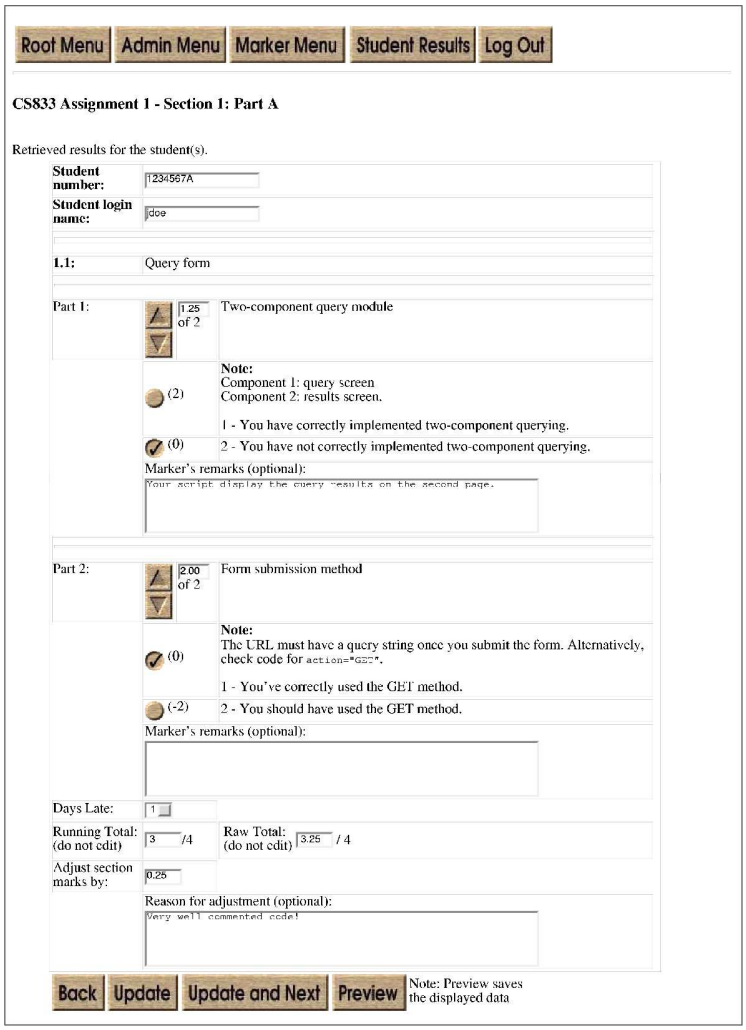


Figure 2: HTML marking form automatically generated from the example configuration file of Figure 1.

overridden manually. To avoid incomplete marking, the form cannot be submitted if any items have not been marked. WebMark allows sections to be marked in parallel by different markers, and supports group submissions.

Using the checklist ensures that most marking is performed according to precise criteria. This aids more consistent marking across all students, and across all markers. We have found that a by-product of using marking forms is greater attention to requirements when designing assignments. This helps students understand what they are required to do, and aids resolution of queries once results are announced.

Results may be released as they are marked. For better control, results may instead be released once all marking is complete. Each student receives a customised email containing the marks and associated comments. An example is shown in Fig. 3. Students can also view this feedback directly from the WebMark server. The identity of the marker can remain hidden, with student queries redirected to a configurable email address. Finally, marking results can be easily retrieved and updated — a major advantage over paper-based records, and invaluable for resolving student queries.

5 Administration interface

The WebMark administration menu is effectively a course administration control panel. From here, staff can manage students enrolled in the course, and modify course access privileges. As marking progresses, the administrator can view detailed statistics for each student and each marker. These are useful for identifying particularly problematic questions, or unusually strict or lax marking. The estimated time to completion of marking is also displayed.

```
From: The CS111 Marking Team <cbloggs@cs.rmit.edu.au>
Reply-To: The CS111 Marking Team <cbloggs@cs.rmit.edu.au>
To: John Doe <jdoe@cs.rmit.edu.au>
Subject: CS833 Assignment 1 - Section 1 result

StudentID: 1234567A
Name:      John Doe <jdoe@cs.rmit.edu.au>

Dear John,
Here is some feedback about this section:

1.Part A

Question 1.1 (4 marks): Query form
~~~~~~~~~~~~~
1.1.1: Two-component query module
Marks: 1.25 out of 2
 - You have not correctly implemented two-component querying.

Your script display the query results on the second page.

1.1.2: Form submission method
Marks: 2 out of 2
 - You've correctly used the GET method.


Your raw total is 3.25.

Your submission was 1 day late, so a penalty of 10% of the assignment
marks (4) applies.

This amounts to a deduction of 0.5 marks.

Adjustments: 0.25
Very well commented code!

Section 1 total:  3 out of 4

------------
Ref:220

If you have any questions about this result, please reply to this email keeping the marking
sheet intact, as this will help ensure your query is handled promptly.
```

Figure 3: Sample feedback email.

Students may be sorted according to a number of criteria. For example, we may order students by their mark in the first assignment, and send an email to selected students with weak results for that component. Emails can also be sent to all students enrolled in the course.

Data from other sources can also be imported into WebMark. For example, student work evaluated in labs or presentations might not be marked with WebMark, while designing and using a marking form for minor assessment tasks or small classes can actually impede marking. In such cases, results can be uploaded to the system. WebLearn (Fernandez, 2001) data is supported natively.

At the end of semester, results for all assessment components must be distilled into a single overall result. With WebMark, components can be assigned different weights, and combined according to different criteria. For example, we may stipulate that to pass the course, a student must obtain at least 60% marks in all assignments and 50% in the exam. The distribution of grades is calculated, and plots of student results for each assessment component and the overall result can be generated.

To cater for students with special circumstances the result awarded to a student for individual assessment components or the entire course can be overridden, while preserving the raw marking data. All data can be exported in a format ready to use in spreadsheet programs, although there is generally no need for this. If calculated externally, overall results can also be imported for record-keeping and for publication through the student interface. In practice, much of the day-to-day administration of the course through WebMark can be delegated to a teaching assistant or head tutor.

6 Manager interface

It is important that students are provided timely feedback. Without this, students have limited opportunity to adjust to the requirements of the course. Late feedback also limits the ability of staff to identify and help students who are not performing well. Many educational institutions specify a maximum turnaround time for assignment marking to be completed and results to be released to the students.

To assist students with planning their study, assignment submission dates are generally known early in semester. Indeed, some schools — ours among them — require academics to publish assignment submission dates before the semester commences. These dates can be used as part of a quality control process to measure assignment turnaround times.

The WebMark management interface allows monitoring of assignment marking progress across courses within a program. For each course, the system calculates the elapsed time between the submission deadline and the commencement of marking, the duration of marking, the number of marked students and groups, and also the average and standard deviation of the student marks. It also generates a graph illustrating marking progress against the milestones. This information allows courses with chronic deficiencies in turnaround times to be identified, and for further resources to be provided where required.

7 Student interface

By supporting efficient marking and detailed comments, WebMark enables timely and useful feedback, and thus enhances the students learning experience. The information displayed through the student interface is controlled by the administrator of each course. Students can view feedback on their work, and compare this with the marking guide. They can also view how end-of-semester results were calculated; an example is shown in Fig. 4. We have found that the more information we provide to the students, the fewer queries the students raise, and the easier these queries are resolved. Students can be authenticated internally through WebMark or through an external mechanism. At the RMIT School of CS&IT, students are authenticated using the School's RADIUS system.

8 Discussion and future directions

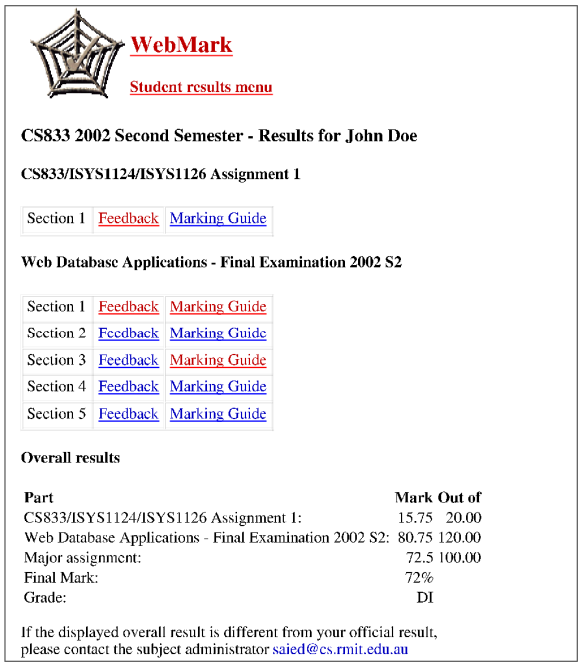
The WebMark marking and course management tool incorporates several strategies that allow efficient administration and improved learning outcomes. It aids consistent marking and provision of detailed feedback to students, while facilitating common administration tasks. WebMark has been used successfully in RMIT since 2000. In this time, it has been used by over three hundred administrators and markers in more than 150 course offerings involving more than seven thousand students.

We are currently collecting quantitative data to compare marking statistics for courses using WebMark and courses not using this tool. A preliminary survey of users produced a generally positive response. Staff praised the ability able to enter a marking scheme, track marking progress and results, and view the average time each marker spends on a submission. The provision for students to view their own results and marks breakdown was also highly regarded, since it reduced the influx of student queries.

Markers commented on how usability depends on how much effort is put into design of the marking form. Having a detailed marking guide helps fast marking and provides more useful feedback to students. However, as with MindTrail, staff find design of the marking guide to be relatively time-consuming (Stevens & Jamieson, 2002). We plan to develop a web-based step-by-step interview to allow administrators to design marking guides without needing to edit and upload a configuration file.

It is often difficult to predict all the criteria that will be used to mark student submissions. At present, changing the marking guide is difficult once marking has commenced. A future release of WebMark will allow feedback items to be added to the list of pre-defined comments after marking has commenced. This would be similar to the approach adopted by WebCoDe (Mason et al., 1999).

We hope to extend the system to natively handle more complex end-of-semester calculations, such as awarding pass marks to students who have barely failed the assignment, but obtained good exam results. We also intend to add support for different levels of marking detail, similar to the schemes proposed by Preston & Shackelford (1999). Another planned feature is the ability to identify students with unmarked submissions, listing the marker to which the work was assigned; this would allow remedial action to be taken. Finally, we plan to support offline marking and bulk uploads of detailed results. While this will reduce the currency of the marking progress statistics, it will enable marking without a constant internet connection to the WebMark server.



WebMark

Student results menu

CS833 2002 Second Semester - Results for John Doe

CS833/ISYS1124/ISYS1126 Assignment 1

Section 1	Feedback	Marking Guide

Web Database Applications - Final Examination 2002 S2

Section 1	Feedback	Marking Guide
Section 2	Feedback	Marking Guide
Section 3	Feedback	Marking Guide
Section 4	Feedback	Marking Guide
Section 5	Feedback	Marking Guide

Overall results

Part	Mark	Out of
CS833/ISYS1124/ISYS1126 Assignment 1:	15.75	20.00
Web Database Applications - Final Examination 2002 S2:	80.75	120.00
Major assignment:	72.5	100.00
Final Mark:	72%	
Grade:	DI	

If the displayed overall result is different from your official result, please contact the subject administrator saied@cs.rmit.edu.au

Figure 4: Detailed results breakdown is available to students through the student interface.

Demonstration WebMark accounts are available upon request, and the source code is also available gratis for non-commercial use. A new version of WebMark is currently in beta-testing and will be released in late-2004.

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