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Computer Aided Feedback and Assessment Systems: a tool for Learning Advisors

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Abstract

A new system for providing feedback and assessment using information technology has been developed. It replicates common “paper-based” proformas that are often used in tertiary education for providing extrinsic feedback and assessment. However, the digital nature of this system has particular benefits for teachers and students as it helps teachers align course objectives and learning outcomes with specific assessment criteria, it records student achievement of these criteria, it automatically calculates grades based on a weighted performance continuum, while also enabling teachers to deliver detailed feedback in a variety of ways. Students benefit from the timely return of detailed feedback and assessment information in which their performance against the assessment criteria is made explicit, particularly when the system is used for formative rather than summative assessment. This paper reports on initial trials of the system at the University of South Australia with teaching staff across a range of disciplines, and explores the potential of the system as a tool for learning advisors who are working collaboratively with teaching staff on curriculum and assessment issues, and at the same time providing learning support to students needing guidance on strategies for meeting assessment expectations.

Introduction

The field of computer aided feedback and assessment is relatively new and very few systems are currently available. The literature refers to this field as “Computer-Aided Marking” (Sondergaard & Thomas, 2004) or “Computer Assisted Assessment” (Denton, 2003). Denton (2003) outlines four main types of Computer Assisted Assessment: (1) Objective Testing such as multiple choice or text match type questions delivered via the Web; (2) Electronic Submission enabling students presenting work to their tutor via email or threaded discussions that enable students to contribute to an on-line debate; (3) Free Text Analysis including plagiarism detection tools that can be used to check for similarities between electronic text files and software designed to automatically grade free text; and (4) Marking Assistants that can aid in the computation of student marks.

Marking Assistants could then be categorized into those that generate reports and those that generate proformas. Electronic Feedback and Mindtrail are examples of those that generate reports that include some statistical data regarding grades and performance. Computer Aided Feedback and Assessment System (CAFAS) and Assessment@yourfingertips are examples of systems that generate a proforma. A proforma or “template” provides space for comments to be added and performance to be indicated (e.g. via slider bars and tick boxes in the case of CAFAS or via a Rubric in the case of Assessment@yourfingertips). The advantage of the proforma system is that blank proformas (devoid of comments etc) can be published to students in course handbooks. This has been accepted as best practice at the University of South Australia and has been mandated for 2007. The beneficial effect this has for students is that they can very clearly see how assessment will be conducted because

typically proformas include all the assessment criteria and a brief description thereof. Weightings for assessment criteria are also included and penalty marks can also be specified which has the effect of warning the student of critical things that they must not do. There is also a beneficial effect for teachers because it requires that they consider the assessment criteria, weightings etc during the development of assessment tasks. In effect systems such as CAFAS become a tool for teachers to develop rational assessment schemes. The real benefit of this is that the assessment process relates directly to the assessment task and therefore students are not as likely to be surprised and disappointed by assessment results and assessors are clearly and consistently focused on particular aspects of the student's work.

Teaching and Learning Benefits

The current CAFAS prototype addresses many important aspects of assessment and feedback. These are discussed in the following sub-sections.

Developmental, diagnostic and summative assessment and feedback

The CAFAS system enables academic staff to efficiently and consistently provide developmental, diagnostic and summative feedback and assessment to students via online methods (for example, email or website). The current embodiment of the CAFAS prototype is designed to enable staff to document feedback/assessment via eight interrelated mechanisms:

Table 1. *Feedback and Assessment Mechanism Types Contained in CAFAS*

	Name of Feedback/Assessment Mechanism	Description of Mechanism
1	“Performance Continuum” for each assessment criterion	Formative feedback which indicates the general performance for each assessment criterion.
2	“Comments” field for each assessment criterion and for ‘Deliverables’ and ‘Grade Penalties’ checklists	Formative feedback comments which specifically addresses particular assessment criteria.
3	“Summary Comments” field	Formative feedback comment which sums up the overall performance in the assignment.
4	Overall grade	Summative assessment which reports the overall grade for the assignment.
5	Assessment Criterion Descriptor field	Explanation of the scope and standards for each assessment criterion.
6	“Performance Indicators” graph (with editable descriptor fields)	Formative feedback addressing generic performance indicators.
7	List of “Grade Descriptors” (with editable descriptor fields)	Explanation of the basic requirements for each type of grade.
8	“Class Feedback” sheet	Formative feedback aimed at the whole class.

Online Assessment

Online assessment is integral to the system. Denton (2003), inventor of “Electronic Feedback”, has shown that using email to provide feedback online is advantageous. As he explains, “Surveys of students indicate that they appreciate receiving feedback via email, even in the absence of their original script” (2003, p. 24). These findings have been corroborated in recent trials undertaken by the authors in 2006. First and third year students studying in the Program of Industrial Design (approx 100 students) and second year students in the Program of Media Arts (Multimedia) (approx 200 students) were surveyed via an anonymous online survey instrument. The types of assignments in these courses included text based reports, technical drawings, and graphics-based website design proposals. Many students reported that the online delivery of feedback via CAFAS was greatly

appreciated due to the convenience of accessing and storing feedback/assessment and for the quality of feedback. In response to the question, “Digital Feedback and Assessment Sheets were emailed to you (PDF file) for each assessment. What are the benefits/disadvantages of this new system for providing feedback and calculating assessment?”, students commented:

“Very clear, can see exactly where you lost marks, which is helpful to know what you need to improve on”.

“Convenience — I can receive them at home instead of going to Uni. Detailed comments were great, so were the graphs”.

“Very beneficial — detailed exactly where strengths/weaknesses were”.

“This was a really good method of feedback. They provided in depth explanation of all facets of the assignments which enabled you to see exactly where you went wrong, or what could be improved”.

“It was fantastic to receive such comprehensive feedback. Since I spent a lot of time on ensuring my assignments were at a high standard, it was nice to know that course staff made the effort to undertake a detailed review of my assignments and provide valuable feedback”.

“This was very beneficial and excellent feedback! Just having a single comment and a score isn't very helpful, but having this digital feedback explains every assessment criteria, as well as percentage weightings, the grade and comments. This feedback should be kept this way”.

“This was genuinely useful in seeing where criteria was and wasn't met and what to improve or look out for in future assessments”.

“Yes, this was a new way of providing feedback to students. The assessment sheets themselves were very comprehensive and allowed for thorough, detailed feedback, which is greatly appreciated. I think overall, the system was beneficial to students, it was just different to see graphs and charts on a marking sheet. Different, but comprehensive = good”.

From the students' viewpoint CAFAS seems to be particularly useful in two contexts. It provides a convenient way for them to access their feedback, and it provides a variety of useful information that they perceive as being useful to their learning and understanding of their assessment.

Assessment of large classes

Assessment of large classes is improved by two mechanisms: (1) large classes are often assessed by multiple tutors — this raises the issue of consistency of assessment. This issue is addressed by a “moderation” function which enables the course coordinator to quickly adjust the grades of a group of students which were assigned by a particular tutor (for example, in the event that a tutor has been “too harsh” or “too soft” in their assessment of student work); (2) a list of standard feedback comments can be generated by the “marking team” or course coordinator prior to assessment. This enables all members of the marking team to rapidly and consistently supply feedback to students via drop-down menus (or similar). More specific, personalised feedback can also be entered as necessary and new “standard comments” can be added “on-the-fly” during the assessment process.

Supporting students studying at a distance

Clarke (2000), while highlighting the importance of teaching staff providing prompt quality student-centred feedback to students studying at a distance, cautions that there is also greater potential for students to misinterpret advice and feedback from academic staff when staff and students are separated by distance. Clarke further suggests that open and distance education adds to the pressures on academic staff because of the need for fast turn-around on assessment and returning feedback, the need to individualise assessment and the problems in achieving consistency and reliability of marking.

CAFAS addresses these concerns through the efficient use of automated grading, the ability to add comments quickly using drop-down menus, while still retaining the ability to personalise comments for individual students, and the convenience in being able to return feedback and assessment to students electronically. CAFAS also addresses these concerns in the context of post graduate students who are typically in the situation of studying at a distance.

Minimising academic misconduct

Although not the main focus of CAFAS, the system has the potential to assist with deterring students from engaging in academic misconduct such as plagiarism. It is possible to include a “Penalty” field titled “Academic Misconduct”. This acts as a reminder to staff and a warning to students; staff must discuss and explain this important issue with students, and, students are warned that academic misconduct is a serious issue — by default a 100% penalty is stipulated for academic misconduct.

Peer review

Peer review as a means of formative assessment is an approach embodied in three of the courses in which CAFAS was trialled. These courses focused on Multimedia design in the Program of Media Arts. In these courses, students are encouraged to submit their assignments for peer review via an online threaded discussion, and to modify their work in response to the feedback they receive prior to final submission of their assignments for formal summative assessment. CAFAS provides a more structured approach to this process, enabling students themselves to use the marking assistant within this cooperative learning environment. By providing students with the tool prior to summative assessment, they are better able to focus on the expected learning outcomes and become strategic adapters who are able to adjust to their peers' comments while also developing higher level learning skills as critical reviewers (Liu, Lin, Chiu, & Yuan, 2001). Providing students with access to the tool in advance of summative assessment also addresses one of the issues raised by students in the initial trials who reported that while they were pleased with the detailed feedback they received in response to each criterion, they would have preferred to have had access to a sample final report prior to submission of their assignments.

Potential as a tool for Learning Advisors

Kokkhin and Stevenson (n.d.) suggest that many students at university experience difficulty in understanding and meeting academic expectations and that assessment is the point where students experience the greatest challenge. As they explain, learning support therefore needs to focus on making academic expectations explicit, and as Bartlett (2005) suggests, this may involve necessarily involves collaboration with academic staff on curriculum, teaching and assessment issues. While CAFAS has been developed primarily to assist teachers and students, the system may also assist learning advisors in supporting students and teaching staff to meet these challenges in a variety of ways.

The system may incorporate a “link” to the learning advisor in the form of an instruction or a suggestion to the student to obtain assistance from a learning advisor (Figure 1). Another possibility, and a more definite “link”, would be an automatically generated email to the learning advisor, which alerts them to the student’s learning needs. This could be quite specific, for example, suggesting the student get help with English as a second language, or it could be a non-specific suggestion to visit the learning advisor. Although these schemes have not been trialled, technically they are possible and seem to be a logical step in the constantly evolving online learning environment. Further consultation with learning advisors, university policy makers and students will be necessary to ensure that the automatic reporting “link” to learning advisors would not be perceived by students as being an unwanted, unsolicited intrusion on their studies. In some institutions it might also be a breach of the confidential nature of student assessment and feedback information.

Summary Comment	
James, you have demonstrated your understanding and skills for the majority of the assessment criteria however you need to focus on improving your referencing skills - poor performance in this area has lowered your grade for this assignment. I suggest you see a learning advisor for further help with this. Regards, Marty	
Help from Learning Advisor	
If one of the boxes to the right has been ticked it is suggested that you contact a Learning Advisor for help with your next assignment. A copy of this feedback sheet has been copied to them so that they are aware of the topic you need help with.	<input type="checkbox"/> English as a second language <input type="checkbox"/> Spelling and grammar <input type="checkbox"/> Essay Writing skills <input type="checkbox"/> Report Writing skills <input type="checkbox"/> Academic Misconduct <input type="checkbox"/> Time Management <input checked="" type="checkbox"/> Referencing <input type="checkbox"/> Other
Grade	P1

Figure 1. Sample feedback to student

Standard Comments

Another area where a learning advisor may be of assistance is with standard comments. CAFAS has the ability to quickly insert standard comments, however the effectiveness of the comment in terms of communicating to the student is determined by the structure of the comment: for it to communicate to the student effectively it must be clearly and concisely articulated. Indeed many lecturers and tutors have developed a notebook of standard comments which they refer to when they are writing feedback to students; however, many teachers have not taken this initiative and this is where they could benefit from the combined assistance from a learning advisor and a marking assistant. The learning advisor will be able to help “craft” a highly communicative standard feedback comment and, via the use of the marking assistant software, enable the teacher to quickly access and enter that comment for a particular student. Indeed one of the services provided by the Flexible Learning Centre (the administration unit at the University of South Australia responsible for academic staff development and student learning support) is the provision of exemplars of “rubric” feedback forms which contain standard feedback comments. These rubric forms can be used directly or adapted to a particular assessment. These forms are a ready source of standard comments that could be easily incorporated into the various comments box drop down menus in CAFAS.

Analysis of Assessment Results

Marking assistants are, at their core, a database of assessment results. Grades, marks and comments are recorded and can be displayed in a variety of ways. The authors have found that students greatly appreciate a graph which shows the grade distribution for an assignment (assessment) – refer to Figure 2. A graph such as this clearly indicates to the student how they have performed in the context of their peers’ performance. The mean grade and mark for the class can also be automatically calculated and displayed. This provides a powerful feedback mechanism and may provide great motivation to students; either to improve or to maintain their current position in the class. The traditional way of publishing this information is a table of student ID numbers and grades. Displaying this information in the format of a graph makes it easier for students to understand – conventional lists of grades do not clearly display the distribution of grades.

Feedback and Assessment Summary



Program	Industrial Design
Course	Industrial Design Studio 6
Assignment	Assignment 2 - DFM Concept Generation
Weighting	35%

Class Results - Grade Distribution Chart

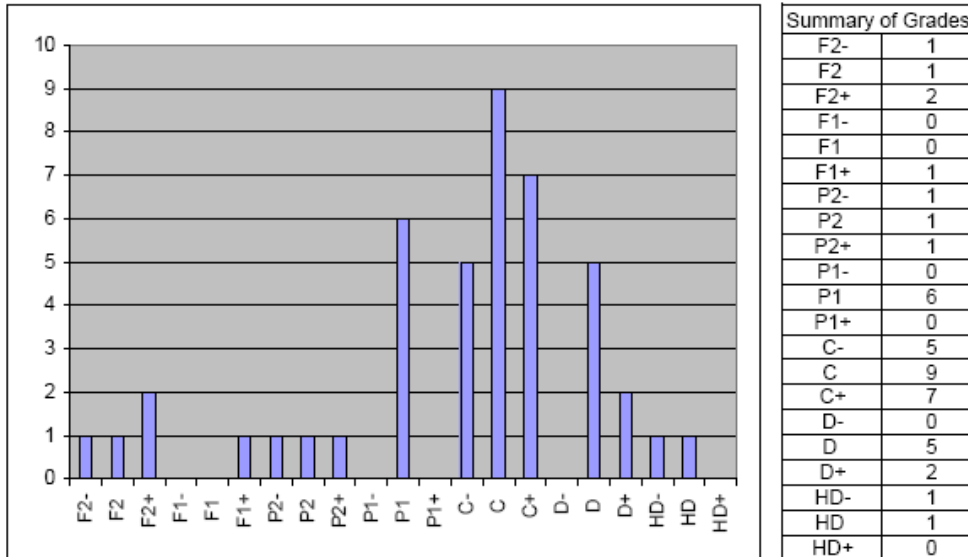


Figure 2. Sample of class grades available to students.

Another useful way of analysing the assessment and feedback data is via the mean mark/grade for each assessment criterion. Figure 3 shows a table of marks for two assessment criteria. Each assessment criterion shows the mean mark for that assessment criterion. This information is potentially very useful to the teacher as it clearly indicates where students are performing poorly: a low mean mark for a particular assessment criterion indicates that many students are struggling with that aspect of the assessment task (assignment). Teachers can react to this appropriately, perhaps by preparing a “revision” lecture to address the misunderstood topic. Or, a learning advisor may be able to work with the teacher to unravel the causes of the students’ misunderstanding. A list of student names could be generated automatically to assist with organising the remedial teaching session and the software could email the students automatically to alert them of the need to attend an extra teaching session.

Student Id	Student Name	Ideation	Gr	Tech Drg	Gr
100002	Names obscured for confidentiality purposes	80	D	65	C-
100019		57	P1-	50	P2-
100029		70	C	67	C-
100017		70	C	65	C-
100031		0	F2-	0	F2-
100016		60	P1	56	P1-
100016		70	C	58	P1
AVERAGES		45.3		30.3	

Figure 3. Table of student grades for particular assessment criteria

Also of interest to the teacher is the individual student’s progression with the subject material. If subsequent assessment tasks (assignments) are being assessed by the same assessment criteria it is

possible to monitor how a student is progressing with particular assessment criteria as the course progresses. It would also be possible to generate an end-of-course report which clearly displays this information (via graphs). Although not currently possible with aforementioned marking assistant software applications, it is conceivable that the software could automatically alert the teacher to particular students who are failing to progress, or are “going backwards” with particular assessment criteria. Currently this is something that is rather difficult to monitor and most teachers do not have the time for this level of scrutiny. It may also be something that students lose track of too, so by displaying this information, in graph format, on feedback proformas students can clearly see how they are progressing (or regressing!).

Given the obvious benefits of these types of information it is likely that the next generation of marking assistants will provide this functionality. Currently, the first two data sets (refer Figures 2 and 3) can be generated with CAFAS, although it takes some time and basic know-how to set up the Fig 3 table in the Microsoft Excel environment.

Conclusion

CAFAS has many advantages for higher education. The online system is efficient and can assist with reducing heavy workloads of teachers and improving student satisfaction and learning outcomes via reduced turn-around times. It should be noted that staff who have embraced this system are typically more adept with computers in general than those who prefer the paper-based method of providing feedback and assessment. Funding has been received from the Carrick Institute for Learning and Teaching in Higher Education to develop the CAFAS system as an open-source, “user-friendly” application, maximizing the likelihood of uptake by academic staff. Mechanisms for improving consistency of feedback and assessment, and for moderation of grades, can facilitate collaboration between multiple markers (teachers) and ensure that the calculation of students’ marks is as fair as practicable. It offers students the benefits of clearly understanding the assessment regime by spelling it out using easily understood graphs, scroll-bars, tick boxes, and text entry boxes. It provides the convenience of receiving feedback in digital format and the flexibility to be used as both a formative and summative assessment tool.

The next generation of marking assistants could provide a link to learning advisors and this possibility will be investigated during the Carrick funded project. There are numerous benefits of a database of information that students, teachers, learning advisors and management can access. By building in a link to learning advisors, students are reminded that they may be of help to them and learning advisors could be alerted to the student’s needs. It is analogous to a general practitioner referring a patient to a specialist. But in this case the “specialist” could have access to a rich database of information relating the “patients” history; this equips them with useful information and should greatly assist with their diagnosis and treatment.

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Further Information about CAA systems

Assessment@yourfingertips has been developed by Alistair Bruce Campbell of Edith Cowan University.

Denton's *Electronic Feedback* can be downloaded from;
<http://www.ljmu.ac.uk/cis/software/feedback.asp>

Freney's *CAFAS* system is under development via a Carrick Institute grant and will be released in February 2008. Email martin.freney@unisa.edu.au for more information.

Mindtrail is commercially unavailable as Mindtrail Pty Ltd was liquidated in 2003.