

Towards Effective Feedback in E-learning Packages: The Design of a Package to Support Literature Searching, Referencing and Avoiding Plagiarism

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ABSTRACT

The paper describe the development of an e-learning package to assist in teaching literature searching, referencing and avoiding plagiarism (information skills) to investigate the effectiveness of different feedback styles (corrective only, corrective explanatory, and video feedback) on student learning. Three version of the e-learning package were developed of which employed a different style of feedback in response to students' answers to formative quizzes. Then experimental testing of the three packages by students who were using the package to support learning in all their modules. Both quantitative and qualitative data was collected to assess the effectiveness of the package. The results of the pre and post test-test quizzes showed a significant increase of 10%. However, this can also be attributed to other teaching activities students were engaged in at that time. The preliminary analysis of the results did not reveal a clear effect for the feedback styles, although the results suggest some variation in students' preference for feedback styles.

Categories and Subject Descriptors

K.3 [Computers and education]: Computer Uses in Education – *collaborative learning, computer-assisted instruction (CAI), computer-managed instruction (CMI), and Distance learning*

General Terms

Design and Human Factors

Keywords

e-learning, feedback, multimedia, simulation, interactivity, information skills, video-based learning.

1. INTRODUCTION

Over the last 10 years there has been an explosion of the use of computers to assist traditional lectures and in many cases deliver the course material. Brunel University has taken up the challenge of computer assisted and based learning in the form of WebCT in all academic schools. Further, most Brunel University students now have access to the Internet allowing

them to engage in the learning process in a virtual environment. E-learning is essential for a modern approach to widening participation, increasing international student numbers, student centred learning and diversifying the routes through university. This is because learning at the computer gives the student a greater level of control over the learning process as computer based learning inherits the key flexibility advantages of open and distance learning [16,5]. These are flexibility of time, space and location of study and process by which students learn allowing the order and depth of study for each topic to be tailored to the student's needs.

With the move towards independent learning and student driven learning, the need to maintain and even augment the levels of feedback in teaching becomes more of a challenge. Good and appropriate feedback is essential and has become the focus for an area of improvement for Brunel University. All students, but especially online learners, need to know if they have correctly understood the material being presented. In traditional teaching, feedback has been the weakest link in the educational process [13]. Feedback is a critical stage of the interactive process that engages learners with the teaching material [6]. According to Race [16] feedback needs to do a number of things:

- Praise (reward the student)
- Comfort (reassure them that their mistake was a reasonable one)
- Direct (offer information on how they could get it right in future attempts).

There are several studies testing feedback in e-learning environments that support Race, suggesting the use of explanations as part of any feedback allows students learn from these explanations (e.g. [9], [15]). It could be argued however that offering only corrective feedback with no explanations may be effective since it encourages students to revisit the teaching material to discover why they have got something wrong thus empowering exploratory learning. All the studies undertaken to date however have not completely addressed the issue of effectiveness and none have explored the use of audiovisual feedback which may favour visual learners.

One way of providing feedback on learning is by providing students with interactive self-assessment questions (ISAQs) allowing them to gauge whether they have understood the material. An ISAQ is a question within the learning environment, which invites a response from the student and then provides relevant feedback. Self-assessment questions are also important for students in other ways as they give them the opportunity to learn by doing, see what points are important, translate the intended learning outcomes, develop their

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confidence, stop them getting bored or passive and help them chose their own pace of learning [16]. E-Learning systems could and should provide feedback and additionally have the possibility of providing individual feedback based on the actions of the learner. Systems can not only identify when the learner has done something right or wrong but can also indicate why this is so. Given that feedback can be of various types and styles (textual, audio, audio visual, corrective, explanatory) what is the most affective? This is the question we asked in the project reported here.

2. THE PROBLEM

Proficiency in information skills is a core requirement of all students irrespective of discipline. The ability to identify, access, understand, evaluate and use information is fundamental to all learning. In common with many universities, Brunel has an information skills policy that sets out how these skills will be developed in Brunel students. The policy follows the Society for College, National and University Libraries (SCONUL) model of information literacy, which details seven skills an individual needs to be information literate, and the levels to which students should be expected to achieve these standards. In addition, the policy draws on research [1;10] showing that the most effective way to teach information skills is to integrate this teaching with the academic curricula.

Students in the School of information Systems, Computing & Mathematics (SISCM) therefore receive information skills sessions, tailored for the subject and level of study, embedded into the core curriculum. However, pressure on the curriculum means that these sessions are ‘one-shot learning’ – the skills development is not blended into the curriculum with organised, ongoing practice and assessment of these skills. This results in, students grappling with these skills as well as the content material being tested .at critical times such as undertaking the first major written assignment, or a final year project dissertation.

To overcome these difficulties, students make extensive use of the one-to-one at point of need help available to them from their subject librarian and the Library enquiry desk. However, such help is limited by the availability of these services (the library is not staffed 24/7) and so is not necessarily available in the time, space or location the student needs it. We therefore felt that there was a need for an e-learning information skills package that can be accessed at any time, both on and off campus to re-enforce the taught sessions, allow practice to take place in a structured way, and provide help at point of need. The package we designed allows students to look at the material presented as text, videos, interactive simulations and formative feedback quizzes, which can be taken at any point in time, to enable confidence in the acquired skills to be established before having to apply them to summative situations.

In producing such a package we have endeavoured to answer a topical and timely research question: Is learning influenced by the style of feedback in e-learning environments given to students? Our working research hypothesis therefore is: *That feedback style and type can have an effect on both knowledge retention and deep learning in students using an e-learning package.*

3. MATERIALS AND METHODS

3.1 Package Design Strategy

Firstly, in consultation with an advisory panel of librarians and cross discipline consultant lecturers, the material and content

for inclusion in the package was selected and the package style formulated. The material was organised into three main topics of study 1. “Finding Information”, 2. “The Harvard Referencing System” and 3. “Understanding and Avoiding Plagiarism”, with a “Help” section. The package was fully interactive. Instructional videos of the relevant subject librarian showed students how to use the library to its full potential. Simulations designed in Flash software were used to guide the student through information searches, to allow experimentation within a structured environment. Each topic had a number of sub topics ending in formative feedback quizzes.

“The Harvard Referencing System” and “Understanding and Avoiding Plagiarism” topics were designed for generic use throughout the university. The “Finding Information” section can be tailored to suit different disciplines, however within the constraints of this project it was confined to SISCM related literature searches. Tailoring to other disciplines is possible through changing the databases and search terms used in the simulations. E-learning best practice as outlined by Mayer [14] and Evans et. al. [7], along with functionality and usability testing ensured the package was of the highest quality. The package, was made available to staff to use in support of their lecture material, and made use of the WebCT Vista platform to ensure both on and off campus access by students. The package, which was not a compulsory part of any module, was made available to 1165 students in SISCM. Figure 1 is a screen shot of the homepage of the package, and Figure 2 is an example of instruction video clip students can see in the package. Finally Figure 3 shows an example of one of the simulations that guides students through finding information.

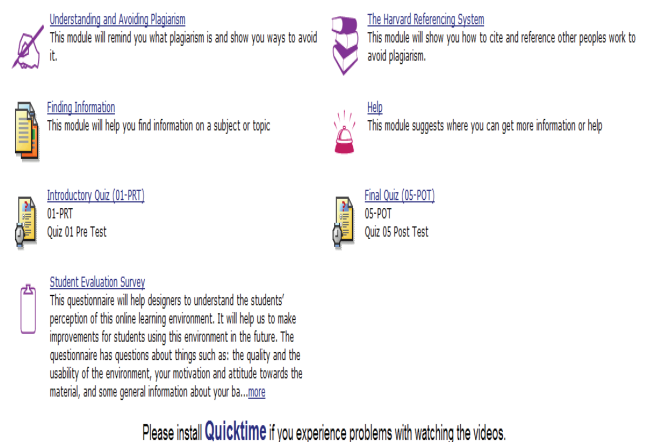


Figure 1: Homepage of the package

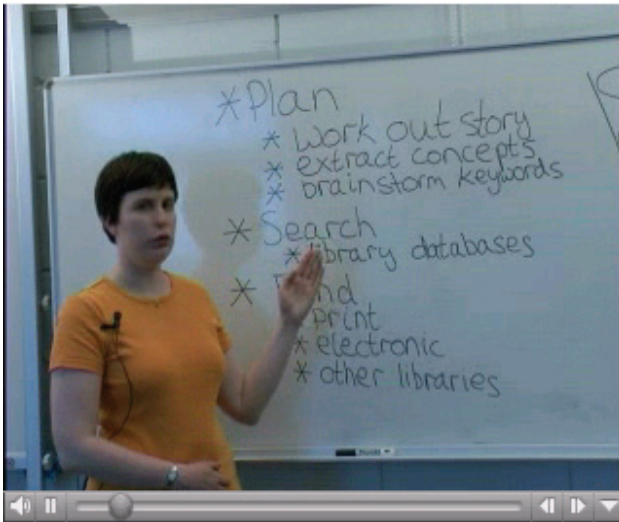


Figure 2: Example of instruction video

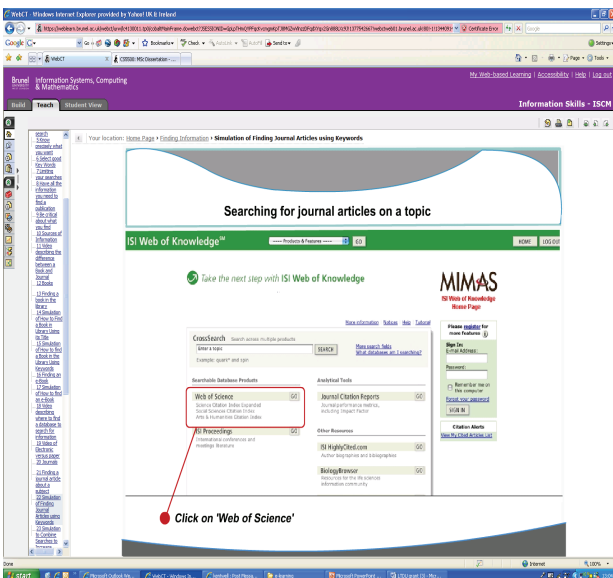


Figure 3: Screenshot of a simulation

3.2 Research Methods

In order to investigate our research question several versions of the package were developed differing only in the feedback given to students on attempting the formative quizzes. Our different feedback fell into three categories 1. Textual corrective feedback only (CO), 2. Textual corrective and explanatory feedback (CE) and 3. Audiovisual or video corrective and explanatory feedback (V). Students were randomly assigned into three groups. Each group was then assigned to one type of feedback for each topic independently, giving all students experience of each feedback style. Thus students acted as their own controls for the experiment. The table below shows how the three groups of students were assigned different feedback styles for the different topics.

A summative quiz, including questions which are designed to test retention and transfer of knowledge, was undertaken online by students to provide us with data on the effectiveness of feedback for analysis. Over 800 students used the package and

took the test in field conditions. The package was used, and quizzes taken, in collaboration with the members of our advisory panel, who agreed to use our package as part of their module where information skills teaching was already embedded. Figure 4 shows a screen shot of one of the quiz sections.

Table 1: Allocation group to feedback styles

Topic	Feedback style		
	CO	CE	V
Plagiarism	Group 1	Group 2	Group 3
Referencing	Group 2	Group 3	Group 1
Finding Information	Group 3	Group 1	Group 2

CO = textual corrective feedback only; CE = Textual corrective and explanatory feedback; V = Audiovisual corrective and explanatory feedback

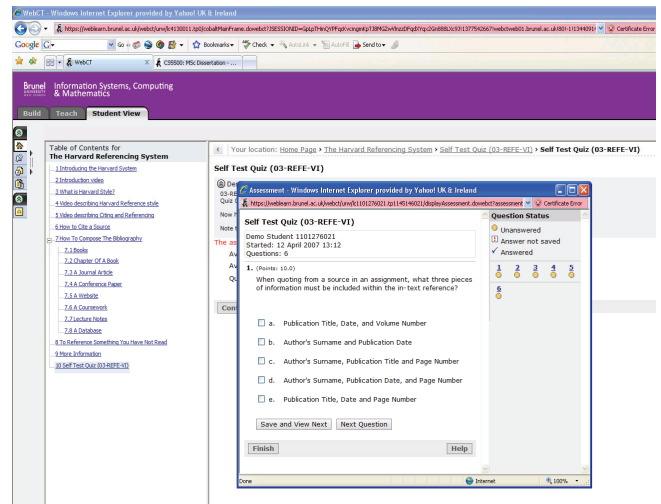


Figure 4: Example of a quiz section

All students were asked to complete an online questionnaire to survey their opinions on the package. In addition 20 students using the package were interviewed on completion of the exercise. Thus we collected data not only on learning effectiveness but also opinions to differing feedback styles. Usage of the package was monitored using the tracking facilities of WebCT Vista to allow us to observe which students were using the package, for how long and what sections, topics and subtopics they looked at most frequently.

4. PRELIMINARY RESULTS

It should be noted that the results presented here are preliminary and represent what has been collected so far in an ongoing project.

Since this package was not a compulsory part of any module we collected data on the usage of the package over a six-month period. This data gave us an insight on how useful the students found the package. 1165 students were given unlimited access to the package. Under 300 students didn't use the package at all but of the over 800 that did the majority used the package several times. There were 1855 independent user sessions with an average of 12 sessions on week days, 5 on weekends. The

average time of a session was just over 10 minutes. This, along with the results of the student survey suggests that students found the package useful and easy to use because they were voluntarily repeatedly using it. The most used files were in the "Finding Information" section with two of the simulations in the top ten files used. Our librarians had given us anecdotal evidence that the issues dealt with in the "Finding Information" section are the ones that students find the most challenging, and the tracking results mirror this and support our evidence that the students are finding the package valuable. That two of the simulations were in the top ten used files is in accordance with previous studies showing the pedagogical value of the use of simulations in training and learning [12, 11,4,8]

Over 200 students did the non-compulsory pre and post test quizzes to determine level of improvement. This gave a significant result as calculated by a t-test, showing a mean increase of test scores of over 10% which was significant at $p < 0.01$ (1 d.f.) when the pre-test scores were compared to the post tests'. The results are given Table 2. Although suggestive of the package's effect, this does not present indisputable evidence that the package can significantly improve the students understanding of the topic being taught as these students might have been involved in other learning activities covering the same topic during this time.

Table 2: Scores in percentage on the quizzes taken before and after studying the package.

	Pre-test	Post-test
Mean	49.0	61.5
SD	14.4	17.9
Median	50.0	62.2

Since the skills being addressed in this package form a part of every assessment our students undertake we looked at the effect of the students using the package on coursework standards. A preliminary evaluation of assignments undertaken by all level 3 students as part of the "Final Year Project" module showed a significant decrease in students losing marks due to poor referencing this year (27; 13.5%) as compared to last year (36; 18.0%). The students making mistakes were notable as not having used the package according to the tracking data. Instances of suspected plagiarism also decreased.

To avoid any prejudice of results, a fellow student interviewed 20 students who used the package. These interviews showed that students were overwhelmingly favourable in their views about the usefulness and usability of the package. The following sample of quotes from the interviews and the student survey illustrate some of the students views:

Question: What did you think of the package?

- "I like the package: during your coursework instead of asking to teacher you can go there and find an answer to your question."
- "Yes it is great, you can read and re-read it. All the plagiarism section was great."

Question: Did you like the simulations?

- "Yes, because it is like to have a tutor telling you what to do. If you don't remember a step, you can just go there and check where you were wrong."

Question: What did you think of the videos?

- "I love multimedia. I prefer than to reading. It fits more in the learning process."
- "Very useful, also for people who do not speak English very well. It is like a tutor online."
- "Sometimes I don't listen to teacher during the lessons. Why do I have to listen to them at home?"

In order to assess which feedback was the best to use in e-learning packages we collected data on both the effectiveness and the students' perceptions on feedback style. The most effective feedback was assessed using the post test results for each of the feedback styles. Since each student was exposed to every feedback style (one for each topic) it was possible using our experimental design to deduce which style was most effective. Table 3 gives the frequency of each score for each feedback style.

Table 3: Frequency of scores obtained in quizzes according to feedback style.

Score	CO		CE		V	
	abs	%	abs	%	abs	%
0	6	5.71	6	5.7	6	5.7
1	24	22.9	28	26.7	31	29.5
2	36	34.3	48	45.7	43	41.0
3	39	37.1	23	21.9	25	23.8

Frequencies have been calculated by extracting the scores for each student for each of the feedback styles. Therefore all topics are represented in each of the feedback styles. The data suggests that there is no significant difference between the styles (Chi squared, = 0.249, 2 d.f.). However a mode score of 3 suggests CO might be better.

Table 4: Mean rating on of Harvard Reference System (HRS) section of the e-package.

Rating item	CE	V	CO
Overall quality HRS ¹	3.55	3.73	4.05
Usefulness HRS environment ²	3.73	4.08	3.82
Usefulness quizzes HRS ²	4.09	4.00	3.55
Average ease of use quizzes ³	6.32	5.76	5.72

¹Scale from 1 (very poor) to 5 (very good); ²scale from 1 (very useless) – 5 (very useful); ³scale 1 (low) – 7 (high)

Perhaps just as important is the student perception of the best feedback style. We therefore studied their rating of items related to the Harvard Reference Style section as level 1 students had looked mainly at this part of the e-package. Table 4 shows the mean rating for 4 questions. Although individual analysis of variance on each of the question did not reveal a significant effect for the feedback style, a multivariate analysis of variance with as independent variable the feedback style found a significant effect (Pillai's Trace, $F(8,108)=2.27$, $p = 0.028$) on the combined ratings. Still the interpretation of this finding is less clear.

5. DISCUSSION

Our data so far suggests that our package was received favourably by students, shown by their willingness to repeatedly use the package voluntarily. The package seems also to be successful in delivering the content, however other teaching activities might have contributed to student's learning. Still the reduction of problems with referencing in final year dissertations is promising. At this stage the evidence about the effective feedback style is inconclusive, which could be due to the limited number of questions in the quiz for each topic/feedback style leading to any small effect being masked by the low number of variables. This part of the study is undergoing further experimentation with a greater number of questions in the quiz to allow even a small differential to be detected. However, the most favoured feedback style as measured by students' perception of usefulness was CE (although this result was not statistically significant), supporting the findings of Iahad [9] and Moreno [15] suggesting that students prefer to know why a particular answer was right or wrong. It is interesting that the V feedback was not as favoured when it contained the same information as CE feedback, the only difference being the mode of delivery being video rather than text. We feel that there could be two explanations for this: 1. The videos being large files took a while to download causing the student to wait for feedback whereas textual CE or CO feedback was given immediately after completing the quiz. 2. We cannot be sure that students watched the videos whereas textual CE feedback was given when the student looked to see the score they obtained on the quiz. This would render the V feedback equivalent to CO feedback since this is all the students see if they do not watch the video. Unfortunately as far as we are aware WebCT doesn't allow the insertion of video feedback without putting CO feedback into a quiz template. Thus the effect of the style of feedback given in WebCT could be damped by the software not allowing immediate feedback. These results might therefore be seen in support of the advocacy of immediate feedback reported by Corbett and Anderson [2] and Dafoulas [3] in supporting student learning and illustrate that one of the most widely used e-learning software could be deficient. Given however that the majority of tutors use off the shelf software to deliver their e-learning content this research will allow practitioners to use these less than perfect environments to their best effect.

6. ACKNOWLEDGMENTS

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