

# WEB-BASED TOOLS AND INSTRUCTION FOR DEVELOPING IT STUDENTS' WRITTEN COMMUNICATION SKILLS

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## Abstract

*Academic writing support delivered via the Internet needs to be rendered in very subject-specific terms for the resource to be of value.*

*This paper reports on a project involving writing support staff and a Computer Science subject leader to develop and evaluate a Web-based academic skills tutorial for first-year students. Language and learning staff worked closely with the subject leader and programmer to construct, evaluate and refine the resource over several years. The tutorial sought to provide online learning support for interpreting an IT assignment topic, extracting information from sources, and integrating the material into a report with the support of online lexical tools.*

*Several approaches to evaluation were used. The part of the evaluation focused on in this paper is the questionnaire administered to 170 students, seeking to determine whether they found the tutorial - including the lexical tools - helpful and if improvements were still required. Results of this are discussed, comparing the international and local student groups. Generally, students perceived most value in those sections of the resource which provided them with examples and models. Other changes noted by the subject leader which may also be associated with the availability of the resource are briefly discussed.*

## Keywords

*Academic skills support, Computer science, Evaluation*

## Introduction

First-year Computing students researching a report may have little idea how to frame their work as an academic text, integrating sources as they go. This is particularly so as most of their research involves consultation of Web sources which are not models of academic writing. A clearer understanding of the relevant discipline- and context-specific literacies is thus required from students (and staff) to sharpen expectations and improve writing. But the development of such programs needs to be carefully framed within the subject context, with formative and summative evaluation focussed squarely on the student experience, as outlined in Nachmias (2002), and Philips, Bain, McNaught, Rice and Tripp (2000).

Funding was sought from the Monash Faculty of Information Technology's Teaching Innovations Fund to develop a resource which would address students' written communication in the subject Computer

Systems (CSE1200). The subject was taught face-to-face with two hours each of lectures and combined tutorial/laboratory sessions each week. Students were required to complete a 1500-2000 word report assessing the current state of an area of computer technology. The subject leader had identified their specific areas of difficulty: using referencing conventions appropriately, avoiding plagiarism from electronic sources, interpreting assignment topics, and responding appropriately to examination questions.

The outcome was intended to be: 1) targeted at the academic requirements of the subject, 2) sensitive to student needs and 3) constructivist in perspective (Clerehan, 2003; MacDonald, Stodel, Farres, Breithaupt & Gabriel, 2001). As Drury (1997) claims, to produce quality courseware which will develop students' writing skills, the two issues of "authenticity" and "integration of computer-based tasks" are paramount. The nature of the collaboration enabled planning of content which attempted to be comprehensive, authentic, and research-based. Delivery of the final product attempted to incorporate a carefully-designed interface, activities encouraging interactivity, and usable tools (MacDonald et al., 2001). The project in its early stages has been discussed in Kett, Clerehan and Gedge (2001).

The project development plan involved the following sequence (steps four-six being recursive and ongoing):

1. Identification of learner needs
2. Defining of learning objectives
3. Choice of learning strategies and development of resource interface
4. Choice of type and amount of content, feedback and interaction
5. Evaluation of resource
6. Adaptation for improvement

For further discussion of evaluating online language and learning skills materials, see Clerehan, R., Turnbull, J., Moore, T., Brown, A. and Tuovinen, J. (in press).

## **Content of site**

The resource was intended to provide Web-based activities which draw attention to the ways ideas are organized and presented in academic texts, with a special emphasis on the discipline of Information Technology. The design of the Web resource, Assignment Writing and Examination Skills (<http://www.celts.monash.edu.au/lls/tif/index.html>), was centred around three separate academic study skills tutorials:

1. Interpreting an Assignment Topic
2. Using Sources in Assignments
3. Analysing and Responding to Exam Questions

The site was developed using a combination of technologies including Hypertext Markup language (HTML), Dynamic Hypertext Markup language (DHTML), Cascading style sheets (CSS) Javascript and Active server pages (ASP). The students access the resource by clicking on a link on the subject page. They can see that all the tasks relate to their subject, and they can link back to a Discussion Forum moderated by the subject leader. They can also link to an Online Student Resource Centre (<http://www.monash.edu.au/lls/sif/sif.htm>)

### ***The Lexical Tools***

A significant aspect of the collaboration was the discussion and consultation about the design of the Web site, and determining what the student group would find most helpful in terms of additional tools. Lexical tools – three online dictionaries and a concordancer – were integrated with a variety of activities to develop academic study skills. A concordancer is a program which can search texts in a corpus to find all occurrences of a selected keyword or phrase in that corpus: it provides multiple examples of the different contexts in which a word is used (see Figure 1).

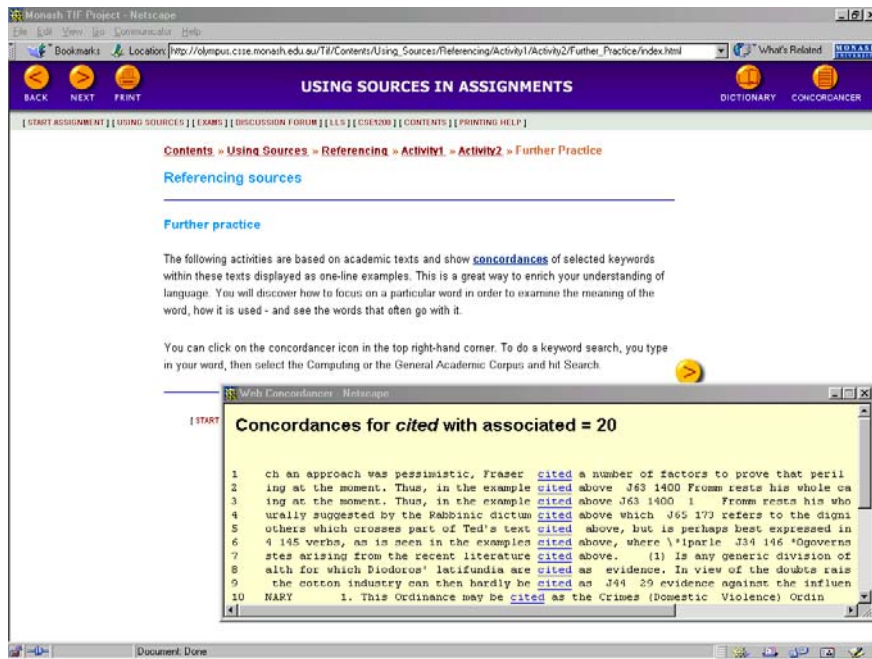


Figure 1: Concordance for the word "cited"

Two online dictionaries were selected, for native and non-native speakers: the Macquarie and the Cambridge International, together with a computing dictionary, *Webopedia*.

The use of a concordancer follows the lead of Chris Greaves, Hong Kong Polytechnic University, who developed an integrated platform for general English language learning in his Virtual Language Centre (Greaves, 1999). Two corpora were established for use with the concordancer: a general academic corpus and a Computer Science corpus. From previous experience in using a concordancer with students it was recognised that many students would be unfamiliar with concordance investigations, and would require clear guidelines on what to search for and how to analyse the concordance data (Stevens, 1991; Turnbull & Burston, 1998). The learning activities were therefore written with this in mind and provided implicit guidance as to the appropriate use of the concordancer. A further online help tutorial was also provided to assist students to use the concordancer independently, if they wished, for their own individual linguistic investigations.

## Evaluation

Formative evaluation of the Web resource was provided by the project reference group, language and academic skills staff peer review, subject tutor review, a student discussion list, and a user survey. Summative evaluation of the resource was provided by an analysis of a sample of 30 student assignments pre- and post-availability of the resource; in five focus groups conducted during week seven of the semester; and then in a second user survey, which will now be outlined and discussed.

### **Materials and Procedure**

A total of 285 students were enrolled in the CSE1200 subject, in semester one, 2001, and 240 in 2002. For the formative evaluations in 2001 and the summative in 2002, students were introduced to the Web resources in a dedicated one-hour laboratory class in the fifth week of the semester. For the formative evaluation, students were offered one topic only from each of the three sections. They were told they could access the site as desired in their own time. Students were asked to complete the opinion surveys in their tutorials in the same week they submitted their assignments, some four weeks after being introduced to the resource. The 2002 summative evaluation, based on very similar questions to the formative survey, was conducted in the same fashion when the Web site development was regarded as complete.

### **Survey Results and Analysis**

For the summative evaluation in 2002, a total of 170 surveys were returned (i.e. 71% of the cohort). The respondents were predominantly in their first year of university; 66% were male, and 57 % named a language other than English as their first language. Approximately 66% of respondents identified themselves as local students and 27% as international students (7% non-responses).

The survey asked how much time students spent on the site, how helpful they found it, and how easy it was to work through.

### **The Tutorial Overall**

The information from the formative and summative evaluation indicated a substantial engagement with the two sections under discussion - Starting the Assignment and Using Sources in Assignments. Approximately half the respondents used these aspects of the resources one to five times, and just under half spent two or more hours on each section. A total of 20% of international students, compared with 10% of local students used the site 6-10 times, as seen in Table 1.

<b>Frequency of use</b>	<b>Local</b>	<b>International</b>
1-5 times	90%	80.5%
6-10+	10%	19.5%

*Table 1: Local and international students: frequency of use of online tutorial (n = 170)*

Thus, student behaviour indicates the vast majority valued the resource sufficiently to use it intensively.

Students were asked about ease of interpreting and using interface elements of the tutorial, navigational difficulties, use of the dictionaries, use of the concordancer, overall content, and overall design. The interface elements appeared to pose few problems, with fewer than 8% having difficulty with links or using boxes, and 10.5% reporting difficulty with using the split screen. Only 9% of the students indicated they found difficulties navigating in the tutorial. There were only a few written comments on ease of use, and more than half of these were positive.

In considering the helpfulness of the tutorial for student learning, it is instructive to see the different percentages of international and local students who found it “very helpful” (section one used as an example):

<b>Starting the Assignment section</b>	<b>Local</b>	<b>International</b>
Overall	18%	32.5%
Text and explanations	19%	30%
Activities	7%	28%
Comments (feedback)	18%	23.4%

*Table 2: Local and international student ranking of “very helpful” for components of the Starting the Assignment section (n = 170)*

The international student group had been identified as the one in need of most support and it can be seen that they consistently rated the tutorial sections more highly than the local students.

Table 3 (below) shows how the whole group ranked the full range of tutorial components in terms of their helpfulness. As can be seen in the Table, while 41-44% of the respondents did not use the dictionaries, of those who did, 50% found the Computing dictionary of some help, quite helpful or very helpful. Only 9% of those who used it found it of little or no help. For the general dictionary, the corresponding percentage was 46%. Only 4% of the students had difficulty in using the computing dictionary and 6% the general dictionaries, compared with 9% and 12% in the formative evaluation. The small number of comments on the dictionaries were mostly positive, saying, for example, that it was “one of the best resources” and that they used the Computing dictionary “all the time”. International and local students had similar responses to the general dictionary, but the Computing dictionary was favoured by more international students (22% found it “very helpful”, compared with 15% of local students).

<b>Tutorial Component</b>	<b>“not helpful /not very helpful”</b>	<b>neutral</b>	<b>“helpful/ very helpful”</b>	<b>“did not use”</b>
The section overall: Starting Assignment Using Sources	8% 9%	36% 30%	48% 52%	8% 9%
Text and explanations in: Starting Assignment Using Sources	11% 8%	25% 28%	55% 53%	9% 11%
Comments (feedback) in: Starting Assignment Using Sources:	12% 11%	27% 22%	39% 40%	22% 27%
Activities in: Starting Assignment Using Sources	14% 12%	28% 22%	36% 39%	24% 27%
Computing dictionary	6%	18%	35%	41%
General dictionary	10%	19%	27%	44%
Concordancer	2%	18%	20%	60%

*Table 3: Overall ranking of the helpfulness of tutorial components (n = 170)*

While a total of 60% did not use the concordancer, 38% claimed to find it useful. Similar percentages of local and international students found it “very helpful” (10% and 7% respectively). A very small number of students experienced difficulty in using the concordancer - less than 2%. There were only half a dozen comments: most of these suggested lack of awareness of the concordancer and its possible use, so it may need to be explicitly demonstrated in the dedicated lab session. It is possible that the concordancer as a tool may be more fully appreciated by students at postgraduate level. With regard to these results, it should also be noted that the term “neutral” has been used by the researchers to denote the unlabelled mid-point: it has been suggested, notwithstanding, that students may be interpreting the scale as a sliding one with the mid-point equivalent to “of some use”. This still remains hypothetical, however.

Most of the students (90%) thought that the on-line help was adequate.

## Discussion

The reason for developing a customised stand-alone Web-based resource linked to the subject page was to address the problems identified in Computing students' approaches to their academic writing. The questions we needed to consider were to what extent the survey results show that the new electronic resources were felt to be beneficial by the students, and whether improvements should still be considered.

The information from the formative and summative evaluation indicated a substantial engagement with both the Starting the Assignment and Using Sources in Assignments sections of the tutorial, with approximately half the respondents using these aspects of the resources one to five times. The elements consistently judged by the students as less helpful than others were those involving the most interactivity: using the Web-based tools; the activities; and the feedback on those activities (Table 3). The activities included, for example, an exercise where the user is asked to compare two student versions of an original source, indicating whether they thought either had plagiarised, then viewing the teacher response. It is noteworthy that the students' ranking of helpfulness of these elements did not alter from the formative to the summative evaluation. It is worth considering whether first-year students, at this stage of their degree and acculturation to online learning, fully appreciate that they can develop understanding by engaging in learning activities on the Web, as well as obtain information from it.

The survey results were very useful in further shaping the resource to meet students' needs. It is evident that the benefits of the dictionaries need to be made still clearer. From the survey results, however, their functionality did not appear to be a problem: by the time of the second user survey, the Computing dictionary was (for those who chose to use it) ranked equally with the most popular feature: the text and explanations. It could be argued that, the lower usage patterns notwithstanding, the availability of new online tools may serve to draw students from their comfort zone, as part of their passage from less to more active learners in higher education (Jelfs & Colbourn, 2002).

### Other Outcomes

There have been some changes in teaching practices as an offshoot of the Web resource development: in particular the citation style (Harvard) was now specified in the student guidelines, rather than left to student preference as before. This meant that students were much clearer about referencing requirements than pre-resource student cohorts. Informal evidence indicates improved student performance. A further change noted by the lecturer was the reduction in individual student queries relating to the assignment, as many previously unclear areas were now illustrated and clarified within the resource. Whilst statistics on incidents of detected plagiarism were not kept in previous years, the lecturer noticed a clear decrease in the number of cases of major plagiarism being detected by tutors, though it should be conceded that detection software is also now being used.

In addition to the user survey results, the assessment results for the equivalent assignments and examinations from 2000, 2001 and 2002 were compared. In 2000, the students had the conventional course without Web-based writing resources. The online resources described earlier were introduced in 2001 and enhanced prior to the start of 2002. Assignment marks did not greatly increase, with the mean result being close to 70% in each year. However, a small but statistically significant improvement occurred between the 2001 and 2002 results ( $t = 2.737$ ,  $df = 459$ ,  $p = 0.006$ , two-tailed). In-depth comparison of the samples of student assignments pre and post-resource is still being conducted.

As the same lecturer set and marked all the examinations in all three years and several years preceding, a greater consistency can be expected in examination assessment patterns than in patterns of assignment results. An ongoing and statistically significant improvement in examination results seems worthy of brief comment, as a small part of the online resource deals with responding to exam questions. Exam marks improved from a mean of 54.836 in 2000, to 57.77 in 2001 to 61.807 in 2002. T-tests indicate the difference in the marks from 2000 to 2002 was significant ( $t = 4.3508$ ,  $df = 477$ ,  $p = 0.00001$ , two-tailed). The difference between 2001 and 2002 exam results was less marked but still significant ( $t = 2.596$ ,  $df = 466$ ,  $p = 0.009$ , two-tailed). It should be emphasised that the relevance of these data to the study at hand is clearly limited: changes in assignment and exam result patterns over time can be attributed to many factors.

## Conclusion and Recommendations

Given the general student opinion that the resource was very helpful, it is important to try to continue and, indeed, increase the frequency of its use. The less positive response to the interactive activities raises the question as to whether this is a reflection on the activities themselves, or on the capacity of first-year Computing students to engage with tasks which they perceive as non-essential. The largely positive response of those who did use them suggests that more work needs to be done to draw students' attention to these elements and how they might use them.

It is a simple matter to make reference to such a resource in lectures, tutorials, and subject literature such as the subject guide and the Web site. It is more challenging to ensure on an ongoing basis that, further to the existing training session, tutors are encouraged to become familiar with the content and therefore more able to refer students with specific problems to the appropriate section of the site (see also Jelfs & Colbourn, 2002).

In order to integrate the resource more fully into the teaching program, as well as devoting a tutorial to orientating students to the site - including the lexical tools - tutorial exercises using specific sections of the resource could also be conducted periodically in the labs in preparation for assignments. For further research, in addition to an examination of the pre- and post-resource assignments, it will be instructive to investigate further the international-local student differences.

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