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Article Review for Undergraduate Science Students

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Abstract

As part of their study in English for Science Education, fourth semester students in the Faculty of Science, Universiti Brunei Darussalam (UBD), complete a module in article review. This paper discusses the development and outcomes of the article review module. Following a short introductory section about science discourse, the paper provides background to the students who contributed to this study and outlines the module and procedures that guided the students' work. The paper then presents students' views of the article review module which were collected by questionnaire, forum discussion and personal appraisal. Finally, the paper briefly discusses what the study has revealed and how it might shape future teaching in the English for Science Education course. The investigation described in this paper was supported by a research grant from Universiti Brunei Darussalam.

Introduction

The study of English language scientific texts in tertiary institutions and the teaching and writing of academic and research English in science is influenced by the work of a number of writers (Trimble, 1985; Hutchinson & Waters, 1987; Swales, 1990; Bhatia, V. K. 1993; Jordan, 1997; Dudley-Evans & St John, 1998:). This type of study, where it is oriented to the academic disciplines of science for instance, is English for Academic Purposes (EAP). EAP is related in content to particular disciplines and their activities; it highlights language understanding and use appropriate to those disciplines. Authentic texts are often used and teaching approaches are often task-based (Flowerdew & Peacock, 2001).

Research in science and technology and the discourses of these fields has diversified in recent years with the increasing popularization of science. This is due, in part, to a perception among some scientists that there is a need to communicate with communities outside those of scientific specialists (Shapin, 1992), and also to the sense of public accountability on the part of many of those scientists who use public finances for research. Increased publishing opportunities enabling communication with a wider audience through online journals and popular science websites (Byrne et al, 2002) have also had significant effects in this regard. Sage Publications *Public Understanding of Science* is one such example of an online journal which regularly features articles intended to promote a spread of scientific knowledge to a scientifically informed and interested segment of the public. The doctoral work of Wood (1998) which investigated the popularization of science concluded that the key issue of the relevance of science to readership resulted in popular texts being a different genre to scientific research texts. This contrasts with more traditional views which have generally failed to fully appreciate the communicative purposes and social contexts of popular scientific texts and to characterize popularizations as adjustments to the intellectual limitations of the public. Other journals such as *Written Communication* and *Discourse Studies* also feature articles from time to time (Paul, 2004) which seek to redefine "the boundaries of scientific discourse and the genres of popularization" (Myers, 2003, p. 265).

The students' practices described in this paper reveal ways in which developments in science related discourses have affected the EAP classroom. Science and technology students use the internet as a primary resource. Research conducted by Sharif and Zainab (2004) at University of Malaya found undergraduate Computer Science and Information Technology students stating preferences for the internet as a source of information as they felt it was the quickest method of providing them with the information they needed. The UBD students involved in this study certainly fitted into this scenario. Information sourced from the internet often lacks the filter of a recognized editorial process so that, as Shapiro (1997, p. 3) reminds, us "while bypassing established editors and producers may give us coverage more to our liking, we must be extra vigilant to ensure the information is accurate".

In the past UBD students had demonstrated poorly developed information literacy skills (Prescott & Prescott, 2004) in that they were often unable to determine the extent of the information they needed for their work or to show an appropriate ability to evaluate information and information sources critically or to substantiate the accuracy of information by reference to other verifiable sources. In many ways this was not surprising because although UBD has an Information Skills course in the Student Learner Development Program (2004), the focus is on process, that is "information technology fluency" (National Research Council Committee on Information Technology Literacy, 1999) or how to use the technology, rather than on the critical discernment and reasoning that information literacy programs usually emphasize.

Background To The Study

At Universiti Brunei Darussalam (UBD) students studying English medium degree programs in Business, Education, Arts and Science are required to take English courses in the first two years of their studies. These are English for Academic Purposes (EAP) courses with orientation to the general discipline being studied, whether Science, Business, Arts or Education. The English-based preparation includes language skills development and enhancement in the context of specific, apposite academic tasks such as report and essay writing, seminar presentation and project preparation. In the final year of their undergraduate degree science students at UBD are required to complete an academic project, which includes a seminar as well as a written submission. Therefore, project preparation and seminar presentation, together with the appropriate supporting language and research skills, have been significant aspects of the UBD English for Science Education course. The article review module described in this paper was undertaken with fourth semester biological science students as part of their English for Science Education course.

Development Of The Article Review Module

The major investigation or academic project students undertake in their discipline studies invariably entails a literature review. The rapid rise of electronic publishing has changed the nature of the traditional, print-based literature review process. Students now have ready access to a rapidly increasing range of scientific and journalistic articles and often find themselves overwhelmed by the proliferation of literature available to them via the internet (Prescott & Prescott, 2004; Prescott, 2004a, Prescott & Prescott, 2005) and may thus fail to distinguish between journalistic articles and academic articles. For this reason, students need to develop additional skills to critically assess the literature they survey.

When the article review was first included as part of the English for Science Education course the extent to which students would seek material from the internet was underestimated. Accordingly, early work was devised with a clear orientation to print material but changing reality forced a rethink. Students' increasing use of the internet and relatively easy access to proliferating, diverse but often unfiltered information required a modification of approach. This reflected the notions of Myers (cited in Charney, 2004) who shows that the conventional distinction between disciplinary and popular scientific discourse is blurring as new means of obtaining information are increasingly available to the public. The situation faced at UBD illustrated very well the fact that sheer abundance of information does not in itself create more informed students (Prescott, 2004b) – it was clear the UBD students needed to develop an understanding and capacity to use information critically and effectively. These perceptions matched those of others, for instance Madden et al (2005) who have written of the concern of teachers about their students' ability to discriminate between reliable and unreliable information sources, feeling that they are too easily swayed by superficial considerations relating to aspects of a website's appearance.

Our response was to revise the article review module included in the English for Science Education course for the semester 2, 2005 science students. This was done in two ways. We developed a small focus module on genre characteristics of science texts and we revised the article review guidelines (see Tables 1 & 2) to improve students' awareness of the characteristics and purposes of texts they were accessing and reviewing. Swales (1990, p. 58) defines genre as "a class of communicative events, the members of which share some set of communicative purposes (which) are recognized by the expert members of the parent discourse community and thereby constitute the rationale for the genre". A primary intention, therefore, was to heighten the students' understanding of academic, journalistic and pedagogic scientific genre as a response to the increased availability of information sources brought about by information communications technology (ICT). Thus the focus module was intended to sharpen the students' analytical reading skills as well as their ability to judge the appropriateness of texts to their own research. In other words, we hoped to shift students from the kind of superficial reading where they looked primarily for information to reading and thinking about subject matter in texts encountered and how this might relate to their work. Critical EAP (Benesch, 2001) seeks to help students take a more active and critical stance towards the education they are receiving. We hoped to achieve something of this more active attitude in our students.

In the genre characteristics of science texts module, emphasis was placed on comparison of certain key features, intendind audience and audience characteristics, referencing practices and layout aspects, language features, the difference between primary and secondary sources, as well as the contrast of certain language features that typify academic, journalistic and pedagogic genres. An understanding of these features aids analytical or critical reading of science articles written in these genres. This applies to

both print and electronic texts. Table 1 presents a number of these basic features for academic, journalistic and pedagogic genres.

Table 1: Genre Characteristics Of Science Texts

Text Type	Audience/audience characteristics	Layout	Language Features	Referencing
Pedagogic	school students with little scientific knowledge and a need for simple explanations	simple sentences short paragraphs, short texts (often 3-5 paragraphs)	restricted range of verb tenses (present simple, present passive), synonyms, comparisons with the familiar	limited (secondary students not interested in information sources)
Journalistic	general reading audience, interested in science but not in detailed scientific information	complex sentences short paragraphs (one or two sentences), article length generally less than two pages	wide range of verb tenses used (present, past, perfect & passive forms) some technical words (often defined or explained), verbal quotations	quotations provide sense of someone speaking, creates sense of immediacy, details about speaker add authority
Academic	university students and science professionals familiar with scientific background and implications, a need for more scientific information	complex sentences long paragraphs inclusion of charts, diagrams, statistics, graphs	objectivity, passive verb forms, technical & specialist vocabulary (not defined)	conventional academic referencing to aid serious research, secondary sources often referred to

The Article Review Module

Article review for the students in the fourth semester of the English for Science Education course at UBD is part of a major piece of continuous assessment work. The main purpose of this work is to simulate seminar preparation and presentation procedure in order to develop the students' research, language and presentation skills in preparation for the discipline-related academic project which is a significant part of their fourth year study. A great deal of in-class and out-of-class time is devoted to the seminar work,

building on the previous three semesters of language development in reading scientific material and writing appropriate academic texts. The revised article review module was incorporated into the seminar preparation phase with students being required to submit reviews of three articles consulted in their investigation of their seminar topic.

First, class work was conducted on genre in scientific writing using illustrative examples. Then the students were given guidelines to help focus their analytical reading skills and their judgment of the appropriateness of texts they would encounter in their own research. They were taught that an article review is not predominantly a summary but that it highlights pertinent information in relation to a context or purpose and may include comments and evaluative statements related to that context or purpose. The distinction between review and summary is found in other programs that take comparable approaches. At the University of Toronto (Procter, 2005, p. 1) for instance, students are advised that:

> *An analytic or critical review of a book or article is not primarily a summary; rather, it comments on and evaluates the work in the light of specific issues and theoretical concerns in a course.*

Students were given examples of academic, journalistic and pedagogic articles and the review procedure was applied to these examples to demonstrate the process. The students' attention was centered on three areas: context, focus, data and methodology as Table 2 shows.

Students researched information for their seminar topics and submitted for assessment reviews of three articles consulted in the course of their investigations. The article review guidelines enabled students to evaluate articles and judge their appropriateness and suitability as texts selected for review. For instance the article review procedure required students to pay attention to the credentials of authors so they were obliged to make a closer scrutiny of authority, affiliation and integrity of sources than was previously the case. Equally, by focusing attention on data and methodology, data display and presentation of evidence many students were able to identify more readily articles of serious academic intent as opposed to some of the inappropriate material they previously reviewed.

Table 2: Article Review: Guidelines

Context of Article	
Register of article	academic/pedagogic/journalistic
Source	journal/book/Internet
Author detail	names qualifications/credentials/authority institutional affiliations perceived quality/integrity of source/article/authors
Focus of Article	
Central concern	General theme or main focus of the article
Discussion	Main arguments or findings
Outcomes	Conclusions and/or recommendations
Data and Methodology	
Nature of data	Single source or multiple sources? Collected by/from individuals or institutions? Is it primary or secondary data? Is it from primary or secondary sources?
Methodology	What methods were used to obtain the data?
Presentation	What evidence or data was finally presented?
Data display	How was the evidence presented? Were tables, charts, graphs, statistics used?

The review guidelines, in combination with direct teaching about characteristic features of academic, journalistic and pedagogic genre, and the use of illustrative examples seemed to help the students react more appropriately and more effectively to information

as evidenced by their submitted products. Therefore, we believed the capacity of the revised article review procedure to assist judgments as to appropriateness and suitability would be significant resulting in more discernment on the part of our students in choosing apposite articles from the internet. In order to ascertain the students' perceptions of the revised article review procedure a small-scale qualitative study was undertaken with fourth semester biological science students.

Students' Views of the Article Review

Procedure

Student views were collected from a small, volunteer group of fourth semester biological science majors; 10 females, 1 male. This gender imbalance is indicative of the ratio of female to male students in the science disciplines at UBD. The volunteers each completed a limited item, open-ended questionnaire, responses were categorized into positive and negative factors based on lexical cues. Then the students were convened in two forum discussion groups, each group chaired by the researcher. The splitting of the students into two groups was to facilitate the recording of all verbal responses, which were subsequently transcribed for analysis. In the forum discussion groups the students were asked to comment on positive and negative views that had emerged from the questionnaire responses. These views were presented orally by the chair (Appendix 1). Finally the students completed a personal appraisal (Appendix 2) of the article review procedure and the points covered during the forum discussions.

Methodology

As indicated above there were three data collection methods in this study; a limited item questionnaire (Table 3), forum discussion groups and personal appraisals. These data collection methods were chosen for the primary purpose of *learning* what the students thought about the article review module. As Patton (2002, p. 1) has pointed out "qualitative inquiry cultivates the most useful of all human capacities: the capacity to learn". Open-ended questions and probes yield in-depth responses about peoples' experiences, their opinions and perceptions of those experiences. Particularly useful are verbatim quotations with sufficient context to be interpretable. In this study the questionnaire asked students about achievement, content and applicability of the article review module. Opportunities to add comments allowed personal views and attitudes to be included. Open forum discussion groups, which allow examination of shared ideas, are a useful method for encouraging reflection and exploration of opinions and can produce more finely textured information than responses to questions are able to yield. Written materials such as personal records or reflections capture ideas that record and preserve context. Personal appraisal offers each participant in an enquiry an opportunity

to reflect on other data collection methods and the responses that have previously come to light.

It is generally agreed that the validity and credibility of research findings are improved (Denzin 1978; Patton 1990) by not relying on a single research approach and methodology. Three different methods were used in this small study in order to try to capture a contextual understanding of the views of the participants. By combining different methods the researcher hoped to avoid the weaknesses of single method studies. Triangulation allows weaknesses inherent in one method to be compensated for by the strengths of another. O'Brian (1993) advocates the use of focus groups to improve survey questionnaires. Also, qualitative data, obtained from different sources, allows the researcher "to sustain a profitable closeness to the situation" under investigation and "allows greater sensitivity" (Holtzhausen, 2001, p. 3). In this study the use of multiple methods was also to compensate for the small size of the student sample

Questionnaire Responses

The respondents indicated their responses to five questions on a scale of 1 (least positive) to 5 (most positive). A sixth field offered the opportunity to comment. The questions are shown in Table 3.

Table 3: Questions For Student Response

	Question
1	The objective of the article review module of *LE2506 English for Science Education 4* was to assist students to distinguish between academic, journalistic and pedagogic articles. To what extent do you think this module achieved its objective?
2	In your opinion were the distinctions between the different types of articles (journalistic, pedagogic and academic) made clear?
3	The article review process emphasizes content, focus, data and methodology. In your opinion how helpful were these categories in analyzing the articles that you reviewed in LE2506?
4	In your opinion to what extent could this review procedure assist your future reading in science?
5	In your opinion was the time allocated to this course module in LE2506 sufficient?
6	Please offer any comments regarding the article review procedure that you wish to make – including suggestions for future development.

Summary Of The Questionnaire Results

The data revealed that these students were generally positive about the article review procedure in key areas of achieving objectives of the module (Q1), discrimination (Q2), analysis (Q3), potential future worth (Q4) and time allocated to the module (Q5). Supporting comments tended to be compatible with the ratings. For instance comments made in relation to question three showed that the categories of the review process facilitated analysis: "Categories helped me to focus on relevant information" and "Categories helped me to filter out unnecessary information" being typical. However, some uncertainties still lurked beneath a reasonably positive attitude to the analysis process as indicated in the following comments: "finding info for the categories can be confusing and "article review still not really clear such as the writing structure of each point of the focus, data and such". In response to question five about time allocation 90% of the students indicated that it was sufficient with the proviso that "We should be made to look at article critiques earlier as students only took the task seriously when presentations were taking place". Table 4 shows these results for questions 1-5 in percentage values for the various levels of response.

Table 4: Students Responses To Questionnaire (Items 1-5)

	Q1	**Q2**	**Q3**	**Q4**	**Q5**
Most positive	27.27	54.54	18.18	27.27	90.90
	72.72	45.45	81.81	63.63	
				9.09	
Least positive					9.09

At the end of the questionnaire respondents were asked to add any suggestions for future development of the article review procedure. Suggestions included:

- further practice with various kinds of articles [5 entries]
- spread the article review work over a longer period [2 entries]
- further focus on appropriate language for writing the articles [2 entries]

Forum Discussion

The second method used to obtain perceptions of the article review procedure was discussion in open forum on positive and negative trends that had emerged from the questionnaire responses. As mentioned earlier students were divided into two groups for technical reasons; numbers had to be limited in order to be able to record all views for subsequent transcription.

In these discussions the respondents were first informed that positive feedback on the article review procedure indicated the categories were helpful and that identifying the structure of articles aided categorizing. There was general agreement with these two notions. The categories of content, focus, data and methodology were considered to aid decisions about article suitability; the focus on abstract and conclusion was considered especially helpful with academic articles as it "makes it easier for us to identify the type of the article in an organized way. Yeah, that's it".

One of the reservations that emerged in the questionnaire comments was a concern that, despite the general positive affirmation, there were times when the categories of content, focus, data and methodology were not clear. Both groups were in general agreement that this confusion usually resulted from articles that were poorly constructed and that the confusion was not necessarily a fault of the review procedure. This notion is captured in the following two comments "some articles, um, they're very confusing, some articles, um, they're sort of like um, very confusing to students whether they're from which register, academic or are they pedagogic something like that…", and "With the first comment, I agree with it. Um, there were some articles it was kind of hard to um to find some of the structure. Um, but um and because some article doesn't have much information…".

Students in the two discussion groups were asked to comment on the suggestions for future development that were made in the questionnaire. Students in one group did not agree with the suggestions that there should be more article review practice spread over a longer period citing the already severe fourth semester workload as the principal objection. Students in the other group were generally more supportive of the ideas of additional time and further practice "I agree with …uh yeah we should start earlier so that will be more time to do the stuff and we get used to it and more samples so that everyone can …everyone can differentiate the type of register", most likely confirming their earlier suggestions. As to the idea of further focus on appropriate language for writing the reviews students in both discussion groups thought this would be a useful addition to the article review procedure. In these issues the discussions reflected and elaborated on the questionnaire findings.

Personal Appraisals

Students in this study also completed personal appraisals of the review procedure where they reflected on their experience of the process and the discussion during the forum. These personal appraisals reinforced a number of student views of the article review procedure. Table 5 shows the positive and negative comments that were noted during these appraisals.

Positive features cited were the helpfulness of the article review procedure in the selection and analysis of articles, in locating relevant information within articles, in dealing with "difficult" articles and in improved confidence to make appropriate choices and write reviews. The belief that there would be future beneficial uses for this article review procedure was again stated and suggestions for additional practice samples and further focus on language features of the review genre were repeated. An additional idea was for greater formal teaching input to help strengthen student understanding. Concerns expressed by these respondents reiterated the need for more time to be spent on language and on the article review procedure; they also commented negatively on the deficiencies of some of the articles that students chose for review.

Table 5: Personal Appraisals: Positive And Negative Comments

Positive Comments	Negative Comments
• article review procedure helpful with "difficult" articles • further samples for practice a good idea (including class discussion) • this procedure helps identify good articles from poor articles • a technique helpful for future studies (e.g. project reports in Year 3) • suggestion for additional focus on language for review writing a good one • the background, the examples and the procedure "really helpful" • structured format of article review procedure increased confidence to choose appropriate articles and write reviews • article review procedure "helps students to find and focus on relevant information"	• some articles poorly constructed • more time needed with this module • some students didn't take this seriously until too late (so ***no*** need for more practice) • lack of intellectual engagement with article contents on part of students negated usefulness of article review procedure • further focus on language characteristics of articles would be helpful

Two suggestions already implicit in ideas emerging in earlier phases of the data collection and which appeared again in the personal appraisals were:

- further practice with various kinds of articles
- additional focus on appropriate language for writing up article reviews

As these suggestions are not the views of the majority of the students only wider canvassing of views from the entire cohort would reveal if the suggestions were generally felt to be valid.

Conclusion

Our intention in undertaking this revised approach to article review was to develop students' abilities to comment on and evaluate academic articles pertinent to their research. The situation was that our students needed to develop understanding and capacity to use diverse and unfiltered information critically and effectively and our response to these needs had to change. Coffin & Goodman in 'Academic writing in an electronic environment' (2003, p. 139) have also written about this issue "Students need to learn to be critical of the information they find on the internet, asking such questions as: what is its source, what is the status of the information, who is the author…". In our revised module we hoped to sharpen our students' analytical reading skills and their ability to judge the appropriateness of texts for their research. We had anticipated shifting students from a superficial information search to reading and thinking critically about subject matter in the academic, journalistic and pedagogic texts they sourced and considering how they might relate to their research needs. Our observations, based on assessment of the students' article reviews, showed that greater care was being exercised in making appropriate article choice and that the reviews themselves were generally more structured and coherent. In the work of the most able students both these factors led to reviews of very high quality. Less able students still found the article review a significant challenge but as results for this aspect of the continuous assessment revealed a positive shift had occurred.

Apart from our own observations the small-scale study described in this paper shows that we have some evidence that the article review procedure described has the potential to enhance the perceptions of students and to contribute to developing their critical awareness. The positive aspects of the article review procedure consistently identified by the students in this study include several elements that are indicative of thoughtfulness. This is in line with the American Library Association Information Literacy Standards (2005, p. 1), which state, "By ensuring that individuals have the intellectual abilities of reasoning and critical thinking, and by helping them construct a framework for learning how to learn, colleges and universities provide the foundation for continued growth throughout their careers".

Finally, how might our findings help shape future teaching? I believe the study shows we are generally charting a desirable route in that we need to build on the positive elements the students have recognized and in addition enhance our work by incorporating some of the suggestions for improvement that have emerged from this enquiry. Specifically, there seems to be clear need for more direct, formal teaching input as well as additional attention to appropriate language at the review writing stage. If we attend to the perceptions of the students, then commencing the article review module and the focus on genre characteristics of science texts earlier in the semester may produce additional benefits. It also seems sensible to make available additional article review practice for those students who wish to take advantage of it. Ultimately, however, the pathway to more critical reading, improved analytical thinking and more coherent reviewing lies with the students and their capacity to utilize the tools made available to them. Additional practice and a more prolonged and carefully delineated language focus are possible within the time constraints identified by the students in this study but the English for Science Education course has recently been reduced by 56 hours so additions to one aspect can really only come at the expense of another.

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APPENDIX 1

LE2506 English for Science Article Review

Discussion Questions

Students made both positive and negative comments in their responses to the questionnaire about the article review process taught in LE2506. This discussion is an attempt to expand on those comments.

1. Positive feedback included "the categories were helpful", "identifying the structure of articles is an easy way of categorizing them". **Do you agree/disagree? What comments could you add?**

2. Negative feedback included "the structure was not always clear" and "the procedure could be simpler in point form". **Do you agree/disagree? What comments could you add?**

3. Some suggestions for future development of the process indicated no further need for modification as the "sample reviews were enough" and that they were "direct and understandable". However some feedback indicated need for modification with "more samples for practice", "more practice early in the semester", and "more practice with a greater variety of texts". **What are your comments with regard to these suggestions?**

4. One comment about copying sentence structures stated that, "examples are useful but we tended to copy the sentence structures from the examples too much." The solution would be to "give a variety of (appropriate) sentence structures early" (in the semester) so that students could practice with them rather than copy them. **What is your response to "sentence structure copying'?**

What are your comments about the solution suggested?

APPENDIX 2

LE2506 English for Science Article Review

Personal reflection

Now you have completed the questionnaire and taken part in the open forum discussion could you take some time to think back over these events:

- Your work on article review during LE2506
- Your completion of the questionnaire, and
- Your participation in the open forum.

Considering all these things are there any further observations or comments you would like to make about the article review procedure, about any of the ideas that you heard discussed in the forum or about other ideas that have occurred to you since and which might be helpful for the future development of this procedure?

Thank you for your time and input- it is much appreciated