

REDUCING CULTURAL BARRIERS VIA INTERNET COURSES

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ABSTRACT

A web-based learning environment has been developed to support students from China who are studying in the UK and are confronted by many cultural barriers, which may impede their academic studies.

The electronic environment incorporates a number of approaches to support learning, ranging from a simple text-based presentation to more active methods, including opportunities to use search-based learning strategies. Experimental results demonstrate a clear advantage for these active approaches.

Internet support was also provided for students in the form of an E-learning course for academic writing, which featured extensive opportunities for interactions with English peers. The experimental results demonstrated that the group with access to the E-course successfully acquired skills, resulting in their academic writing being indistinguishable from native English speakers.

INTRODUCTION

Moving to and staying in a foreign country involves innumerable challenges and changes (West Virginia University, 2003). Some of these barriers are associated with English language proficiency, some with the need to adjust to the host country's academic culture (Rao, 1979), and some are associated with living in a new community culture. The barriers come from not knowing what to do in a new environment (Guanipa, 1998).

The term, cultural shock, was introduced for the first time in the early 1960s, when the anthropologist Oberg (1979) noticed the phenomenon of culture mismatch that overseas students met and pointed out that "cultural shock is precipitated by the anxiety that results from losing all our familiar signs and symbols of social intercourse". Cultural shock concerns people's experience that can cause "intense discomfort, often accompanied by hyper-irritability, bitterness, resentment, homesickness and depression" (West Virginia University, 2003). The study of cultural shock focuses on the differences between home country and host country. It is the simple differences between the way a culture affects our communication and interaction with "foreigners" that makes our own idiosyncrasies stand out (Furnham, 1997).

What makes the overseas students feel more alien is that people in the host country are largely indifferent to all these troubles. It is difficult for Western teachers to imagine how the world of the university appears to a student coming from a cultural background that includes not only a language very different from English but also a way of viewing the world that differs greatly from the expectations of the university discourse (Basham, 1991).

The 1990s saw a renewed interest in the study of writing across cultures, especially the importance of contrastive rhetoric as a means of raising awareness among teachers of different first language (L1) backgrounds and the effects of these backgrounds on second language (L2) writing. In particular, Leki (1992) focused on the benefits of contrastive rhetoric for ESL teaching, and included not only the texts that students are writing, but the processes that students go through as they work on their writing and the social and cultural contexts in which those processes are situated.

In order to prepare students who are likely to study abroad and will experience cultural shock, Harbin Institute of Technology designed a web-based supplement course for English as a foreign language (EFL) students. The supplementary materials dealt with a wide range of cultural knowledge (e.g. transport, accommodation, academic life), presented using a variety of modes (e.g. text, multi-media and use of search engines), together with materials presented on bulletin boards, and in the form of “drag and drop” interactive exercises, illustrating different academic writing styles.

METHOD

The communicative language theories of the 1980s suggested that emerging technologies could support the development of learning environments which were culturally and experientially much richer than previous technologies, and could be used to overcome some aspects of the cultural shock experienced by students travelling abroad. The media associated with these theories (e.g. e-mail, internet chat) offered the first real steps toward opportunities for language learners to communicate and receive immediate and meaningful feedback. The 1990s saw the advent of high-powered multimedia desktop computers providing access to integrative web-based multimedia, that could place learners in authentic situations where learning simultaneously involves listening, seeing, reflecting, doing and participating. The culmination of these technological developments is a sophisticated tool set which supports the creation of rich environments for active learning (Grabinger & Dunlap, 1996).

Centring around language learning that has become more discourse oriented, interdisciplinary and culture-centred, the experimental website and E-course use multimedia technologies which give students access to a broad range of learning materials. In this intertwining practice of reading, writing, listening, speaking and research skills lies the great potential for helping students overcome both language and cultural problems (Greenscoro, 1996).

While technology alone cannot reform education, it serves as the catalyst for change because of the new opportunities it presents and the new demands it makes on teachers,

administrators, and students (Tilis, 1998). Multimedia integrate the educational process by transporting students from the linear mode of learning to the relational and the creative mode of inquiry. The experimental website and E-course provide this through their hyperlinks to authentic materials. The information dissemination systems also provide multimedia resources for information retrieval and browsing and these multimedia resources extend the richness of the learning environment. The website and E-course include links to a range of search engines that encourage learners to be active in searching, analysing and manipulating retrieved material and in constructing their own artefacts and mental schemas (Boyle, 1997).

PARTICIPANTS

Cultural knowledge website experiment

Altogether 75 Chinese students were involved in this experiment. There were thirty students in the experimental group [E1] (twenty-four male students and six female students) and thirty in the control group [C1] (twenty-five male students and five female students). Both of these groups were very similar in that they were all PhD candidates majoring in natural science in different departments of Harbin Institute of Technology (HIT), China. They had all learnt English for about 12 years before they were admitted as PhD candidates. All of them had passed the National Entrance Exam for postgraduate candidates, and their English levels were equivalent to IELTS 6.0. All the students in this university were allocated to different classes balanced according to the entrance exam grades, their general competence being at an equal level.

The UK experience [UKE] group consisted of 15 Chinese students newly arrived in the UK, to follow the Diploma in Management and English (DME). This group was used to see to what extent they could acquire the defined aspects of English culture by being present in the target culture.

Although the UKE group has a different academic profile to both the E1 and C1 groups, the UKE data enables several essential characteristics to be established. First, do students from different academic backgrounds (PhD, DME) have a similar lack of

knowledge of UK culture? Second, does this knowledge increase simply by living in the UK? Third, are any increases in cultural knowledge spread equally across the questions associated with different pedagogic methods?

Academic writing style E-learning course experiment

Altogether 90 Chinese students and 15 English university lecturers were involved in this study. This included the 60 students from the cultural knowledge experiment [C1 and E1 groups], with an additional thirty Chinese students majoring in Chinese in China [CMC], who were asked to write an essay as a comparative parameter to detect their contrastive rhetoric features in Chinese. Fifteen of these students were from Harbin Teachers' university and fifteen from Heilongjiang University, two of the top universities in Heilongjiang province. All of them were in their final year of their first degree. They had been trained to write in Chinese from primary school to university. None of them had been abroad and, therefore, their writing represents the Chinese rhetorical style. The fifteen English university lecturers [EUL] at Salford University were asked to write model essays for the purpose of this research. Their essays were used as a baseline to compare with the writing style of the non-native speakers in the experimental [E1] and control group [C1], and the Chinese writers specialising in Chinese [CMC].

MATERIALS AND PROCEDURE FOR THE CULTURAL KNOWLEDGE WEBSITE

Materials used in this website mainly come from three sources: published books on guidance for overseas students, British council documents for helping overseas students, and relevant websites for overseas students studying in the UK.

Each week during the semester students in the experimental group were offered the opportunity to study a new topic dealing with cultural knowledge and differences between cultures. Ten topic areas were available:

- | | |
|--------------------------|----------------------------------|
| 1. transport | 6. socialisation/holiday/tourism |
| 2. registration | 7. assignment/dissertation |
| 3. accommodation | 8. graduation |
| 4. in-class behaviour | 9. job application |
| 5. after-class behaviour | 10. job interview |

In addition to determining the effectiveness of the website in general, this experiment was also designed to detect which approaches were most effective in removing the cultural knowledge barriers. The five approaches included hyperlink, multimedia, search, text-based information, and reflection:

i Hyperlink

Hyperlink refers to the addresses in the website selected by the course director to which students could turn in order to comprehend the topic and complete the exercises in each unit. These addresses led students to the resources on the web specially selected to fit within the scope of the topic. For example, the hyperlink in unit one presented the transport systems in the UK, enabling students to make comparisons and figure out a form of transport that would meet their needs for the set tasks.

ii Multimedia

Much of the hyperlinked website content was particularly rich in the types of media presented. Multimedia refers to website content in which there were different combinations of media, especially text with pictures and sound or movies, rather than text only. These combinations offered richer, multimodal stimuli to the students.

iii Search

Students could also use search engines to extend what was presented in the website. Search engines such as Yahoo and Google were made available to help the students solve set problems. For example, one task required students to obtain information about opening a bank account after they have arrived in the UK, and a link to Yahoo was provided for the students to use in their search for relevant information.

iv Text-based information

This refers to the materials that the course director had selected and prepared as text materials for the students. For example, students were given information about registration and were informed within the text that they should go to a local police station to register with passport, photographs, registration fee and residential address. This form of presentation required little participation from the students and although mounted on the website, it was little more than the traditional form of text information, more usually found in duplicated student handouts. It epitomises a traditional rather than an active, multi-sensory approach.

v Reflection

In this part, situations were presented to students and they were required to use their own understanding of the text-based information materials in the website to make a judgement or decision. For example, the information on how classes are run in the UK was given in text format, and students had to decide whether they should get involved actively in a discussion or listen to what others were saying attentively. There was, however, no feedback or additional links to help in the decision-making process.

Students from both the experimental group [E1] and the control group [C1] had four hours of English per week in a traditional classroom. In addition to that, the experimental group had access to the website for cultural awareness. The time that students in the experimental group spent in the website was expected to be 20-60 minutes per week for each unit. The UKE group attended a regular DME course at Salford University, which had no input for cultural knowledge.

MATERIALS AND PROCEDURE FOR THE ACADEMIC WRITING STYLE E-COURSE

The materials used in the E-course came from three sources: model English essays designed for the IELTS practice (published by Cambridge University Press); model English essays written by English native speakers (lecturers at Salford University); the English essays written by the Chinese students in this study, as an input to trigger online discussion and feedback from both the tutor and other English native speakers. Students' first draft essays were also put into the E-course so that everybody could see how the improvement was made.

Students wrote the first draft of their essay and then they were asked to compare their draft with the contrastive features in the E-course website with questions such as: what is the main idea of the essay; what are the topic sentences of each paragraph; are the metaphors/proverbs appropriate; have the discourse markers helped make the ideas coherent? Based on their responses to these questions, they revised their first draft.

This stage was followed by discussion online, with students putting their revised draft on the bulletin board. Input also came from English students who were studying the Chinese language at Salford University, UK. They made comments on what they thought would improve drafts and consulted the model essays to support their comments, encouraging the Chinese students to reflect on their drafts and suggest revisions.

Taking all these comments into account, including comments from their native speaker peers, the students produced their final versions of the essay. In addition to the four hours of English language per week and access to the cultural knowledge website, the experimental group [E1] used the E-course for academic writing. Again, the expected study time was 20-60 minutes per week.

ASSESSMENT OF PERFORMANCE

Cultural knowledge website

The pre/post-test for cultural knowledge was designed with the same proportion of questions for each of the five pedagogical approaches and for each of the ten units related to cultural knowledge.

The content of the test was arrived at by asking groups of newcomers and overseas students who had been in the UK for more than a year what difficulties they had met on arrival. The International Office from both The University of Hull and the University of Salford provided guidance on the difficulties they had encountered when receiving overseas students. This information was matched with what British Council had discovered and to publications in the books and journals concerned with this area. In this way, the questions related to genuine practical barriers.

A multiple-choice questionnaire of forty items was devised, with eight items for each of the five pedagogical approaches, and four items for each of the ten topics. These test items were checked by lecturers in China and in the UK specialising in research in this area and a pilot study was conducted with the test items. Following this pilot, 10 ambiguous questions were deleted.

After being tested in the pilot studies, the instruments were considered to be relevant and acceptably worded. On the basis of the results, thirty items remained to be used in the main study. On completion of these procedures, it was felt that the instruments in their modified form could be used with confidence for the main study. The final version was considered to:

- cover all the unit's lesson objectives;
- be stated in clear terms;
- be free from extraneous clues that might help students to guess the correct answers;
- be free of overlapping items;

The final-version of the test was used as a pre-test before the experimental period and the same test was administered as a post-test following the course. The test consisted of thirty questions in the form of multiple choices corresponding to the ten units on the website. There was no weighting between different types of response, the correct answer being awarded 1 point. The three groups received the same form of instructions, which were given in English.

Academic writing style E-course

Two assessments were used in this study: the analysis of the first and final essays. In the pre-assessment of the E-course, all the students from the C1, E1 and CMC groups wrote an essay of about 400 words. Then, the essays were analysed according to five aspects of contrastive rhetoric, which provided quantitative data in comparable forms across languages. The same definitions of terms were applied to both sets of data (English and Chinese) for the five aspects of rhetoric :

- paragraph position of thesis statement,
- number of topic changes within a paragraph,
- number of paragraphs,
- use of metaphors,
- number of discourse markers.

Essays written by the native English speakers [EUL group] were used to obtain an objective comparative view for these five aspects in English. Essays from the CMC students were used to compare the contrastive features in Chinese. Scores for the five rhetorical features for the first and last essays were analysed to determine the shifts in writing style for the control [C1] and experimental groups [E1].

The essay rating system in HIT, China is an holistic grade on a scale of 100, using a system of blind marking. Two raters marked the essays and if the discrepancy between the two marks was more than 10 points, a third person was available to re-examine the essay. However, in no case did the raters disagree by more than 10 points. Smaller differences in grades were averaged to arrive at a single, final grade.

RESULTS AND DATA ANALYSIS

Cultural knowledge website

The data from the experimental study on practical culture and the associated hypotheses were investigated using the Statistical Package for the Social Sciences (SPSS, version 10.0). The initial analysis was conducted to determine the base level of test scores for the three groups (C1, E1 and UKE) in order to establish that there was no significant difference in the pre-test scores, and hence no difference in the cultural knowledge prior to the experimental period. This was confirmed by a one-way ANOVA [$F(2,72)=0.212$, $p=0.81$].

The experimental hypotheses are:

1. that there will be a difference in the post-test scores between the control group [C1], which received no specific teaching or learning activities aimed at the acquisition of knowledge of English culture during their 12 week language course, and the experimental group [E1], which received an additional teaching unit in the website per week during the 12 week language course, and that the difference will favour group E1;
2. similarly, that there will be a difference in the post-test scores between the control group [C1], and the UKE group, which was exposed to English culture during a semester of study at Salford University, and that the difference will favour the UKE group;
3. and that there will be no difference in the post-test scores between E1 and the UKE groups because the additional teaching units studied by the experimental group [E1] in the website would be as effective at teaching English culture as time spent living in the UK cultural environment.

These were confirmed by a one-way ANOVA, $F(2,72) = 15.36$, $p<0.001$, and multiple Bonferroni t-tests (C1 vs E1 and UKE group, $p<0.001$; E1 vs UKE group, $p=0.23$) [see Appendix 1 for details of ANOVA and Bonferroni tests].

Having established that studying the website is as effective as living in the UK for a semester, in terms of acquiring the cultural knowledge as defined in the experimental test items, a further analysis was conducted to establish the nature of any differences in the impact of the five pedagogical approaches used in the website. However, should such differences arise, they must be set against the fact that there are no differences between the test items prior to the experiment, and that after the experimental period differences are not found between items associated with different pedagogical approaches for the UKE group. If differences between items are also found for the UKE group, it may be inferred that these differences arise for reasons other than the pedagogical approaches, for example, because the information associated with some items is simply easier to acquire. A two-factor mixed ANOVA for pre-test results on the test items associated with the five different website pedagogic strategies (hyperlinks, multimedia, search, text-based information, reflection) and the three groups of subjects (C1, E1, and UKE) confirmed that there were no differences before the experimental period, [pedagogic strategy, $F(4,288)=2.229$, $p=0.066$; strategy x group, $F(8,288)=0.887$, $p=0.528$].

A further two-factor mixed ANOVA for pre-post test gains on the test items associated with the five different website pedagogic strategies and the three groups of subjects confirmed that there were statistically significant differences after the experimental period, for both pedagogic strategy and the interaction between strategy and the groups [pedagogic strategy, $F(4,288)=2.925$, $p=0.021$; strategy x group, $F(8,288)=2.556$, $p=0.01$]. However, further one-way ANOVAs demonstrated that there were no significant differences between the pedagogic strategies for pre-post test gains for either the C1 or UKE groups [C1, $F(4,116)=0.45$, $p=0.773$; UKE, $F(4,56)=1.748$, $p=0.152$]. A confirmatory one-way ANOVA provided evidence of statistically significant differences between the pedagogic strategies for the experimental [E1] group who had used the website [E1, $F(4,116)=8.311$, $p<0.001$], and further dependent t-tests showed that while there were no significant differences between the gains associated with the multimedia, hyperlink and search items, and no significant differences between the text-based information and reflection on text items, all differences between the former (multimedia, hyperlink, search) and the latter (text-based, reflection) were statistically significant (Table 1). The differences in gain scores associated with the pedagogic approaches are given in Figure 1, showing that those approaches involving more

interactive, multi-sensory learning are more effective than the passive receptive approaches, associated with the text-based materials.

TABLE 1 AND FIGURE 1 ABOUT HERE

Academic writing style E-course

The data from the experimental study on the E-learning course for writing style and the associated hypotheses were also investigated using the Statistical Package for the Social Sciences (SPSS, version 10.0).

Pre-experimental results

The initial analysis was conducted to determine the pre-course base level scores for the five categories of rhetorical style for the three main groups: Chinese writers [CMC], UK writers [EUL], and the Chinese students of English, who would form the experimental [E1] and control [C1] groups for the experiment, in order to establish the relative performance of the groups. An initial one-way ANOVA indicated that there were statistically significant differences in the number of words written by the groups [$F(3,101)=12.158$, $p<0.001$], and further t-tests indicated that the differences were between the Chinese students of English [C1 and E1], who wrote fewer words, and the Chinese [CMC] writers and UK writers [EUL]. Comparisons between these groups were standardised, with counts per 100 words.

As was predicted from previous research in the field of rhetorical styles of writing (Kaplan, 2001), all comparisons between the Chinese writers [CMC] and UK writers [EUL] were statistically significant [discourse markers, $p<0.001$; number of paragraphs, $p=0.013$; metaphors, $p=0.001$; topic changes, $p=0.007$; thesis statement, $p=0.001$]. The EUL writers used significantly more discourse markers and paragraphs, and tended not to use metaphors or change topics within a paragraph; they also usually indicated the main thesis of the essay within the first paragraph.

The E1 group was found to be midway between the EUL and CMC writers, having statistically significant differences in three of the five rhetorical measures (number of

discourse markers; number of paragraphs; use of metaphors) when compared with both EUL and CMC writers; they remained indistinguishable from the Chinese writers in terms of their thesis statement, but had become indistinguishable from the UK writers in their lack of topic changes within paragraphs.

These results indicate that the E1 students have shifted their style of writing towards an English style, but remain distinguishable from the group of English academic writers [EUL] in four of the five measures. The E-learning course was designed to further strengthen this shift, in order that their style would become indistinguishable from the UK style, thus removing one of the cultural barriers to success in their studies abroad.

Post-experimental results

During the experimental period the Control group [C1] did not have access to the E-learning course, which provided learning materials about contrastive rhetoric features for the Experimental group [E1] and opportunities to discuss their writing with native speakers of English.

An initial one-way ANOVA indicated that for their final essays there were no statistically significant differences in the number of words written by the C1 and E1 groups when compared with the essays written by EUL writers [$F(2,72)=0.835$, $p=0.438$].

Analysis of the post-experimental data showed that the E-learning course had further closed the gap between the E1 and the EUL groups for two of the measures which prior to the experimental period had shown the E1 group to be in a midway position [discourse markers, $F(2,72)=31.946$, $p<0.001$; paragraphs, $F(2,72)=14.428$, $p<0.001$]. The Control group [C1] remained midway between the CMC and EUL groups.

The position of the thesis paragraph, for which the pre-experimental scores were similar to the CMC writers, also changed significantly for the E1 group [Pearson Chi-square ($df,3$) = 8.592, $p=0.005$], with 66.7% of writers placing the thesis statement in the first paragraph, compared with 28.3% before the experiment. However, there was no reduction in the number of E1 students changing topics in a paragraph, because the group had already adopted this approach to their English writing style. The E1 group's

use of metaphor remained significantly different to the UK style [Pearson Chi-square (df,2) = 6.681, p=0.035]. These results are summarised in Figure 2, which shows the post-experimental results for the C1 and E1 groups relative to their pre-experimental performance, and the performance of the Chinese writers [CMC] and UK writers [EUL].

FIGURE 2 ABOUT HERE

These results show that the E-learning course which was designed to strengthen the shift in rhetorical style was successful in three of the four measures (discourse markers, number of paragraphs, thesis paragraph) for which differences had been identified prior to the experiment.

DISCUSSION

Students studying abroad are presented with a number of barriers which may interfere with the successful completion of their academic work. The website described in this paper was set up to prepare students for their studies abroad and to ameliorate some of the associated cultural barriers. The results for both cultural knowledge and academic writing styles indicate that additional web-based study can significantly reduce these barriers. However, simply transferring traditional text-based materials to the web will not necessarily improve student learning.

Conlon and Simpson (2003) recently demonstrated that teaching and learning in Scottish and American schools has not significantly changed as a consequence of the introduction of new technology, concluding that:

Finally, we think it relevant to recall an observation made by Spencer (1991), that progressive change in education requires the emphasis to be placed upon the technology OF education rather than the provision of technology IN education. By this, Spencer meant that questions about educational purpose, curriculum and pedagogy ought to be answered (or at least, addressed) before

any attempt to specify configurations of hardware and software.

The evidence is that Spencer's advice has not been heeded.

The cultural knowledge website was set up specifically to provide evidence for the primacy of pedagogical methods, adopting the situated cognition view that different situations will call for different tools, models, and methods, and that instructional methods are seen as 'tools to be appropriated by participants within the local situation, rather than general prescriptions to be used in all learning situations' (Wilson and Myers, 2000, p74). Kozma (1994) suggested that the new internet-based technologies could be used to implement constructivist pedagogies that were beyond the scope of previous educational technologies. Clarke (1994), who had long advocated method rather than media effects, argued that this was unlikely to be the case. More recently, situated cognitive theorists have argued for a reconciliation between different pedagogical and media views, and the application of theories according to the situational demands. In the case of the cultural knowledge website, part of the teaching method was reliant on the transfer of traditional text-based materials to the internet for ease of distribution. In essence, these materials represented no advance on printed handouts, and may even, on a full-cost basis, be more expensive. The remaining materials either offered multi-modal authentic learning experiences, or more active methods for solving problems and for communication. The results are quite dramatic for cultural knowledge: the experimental group showed no improvement over the control group scores on the traditional text-based items; however, for the active, multimodal items the experimental group scores were significantly greater than the control condition, and no different to the group which had acquired its knowledge by living in the UK for a semester. This offers support to Kozma's argument, while not ruling out Clarke's perspective: the internet provides the right environment to support exploration of authentic materials, but other media, including text-based exploratory formats, may encourage similar approaches and be just as effective.

The academic writing course results do not offer conclusions concerning the appropriateness of alternative pedagogic methods. However, the results clearly indicate the effectiveness of the socio-cognitive communication methods afforded by email and bulletin boards.

In conclusion, the results tend to support active, multi-modal methods as being more effective than purely text-based materials for the advanced students taking part in this course. The evidence also shows that students learn as much from a method that poses problems and a means of solving those problems (searches) as from more structured materials (multimedia and hyperlink selections). This is encouraging because it demonstrates the potential for lifelong learning through the use of internet technologies, such as search engines, enabling students to adopt a just-in-time approach to solving problems. Students travelling abroad who have developed these transferable skills for solving cultural problems, will see them translated into a powerful technique whenever further adjustments to new cultures are required.

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Figure 1: Mean gain scores on test items associated with different pedagogic strategies (information; reflection; multimedia; hyperlinks; and search) for the Experimental Group [E1], compared with mean gain scores for Control [C1] and UK experience [UKE] groups

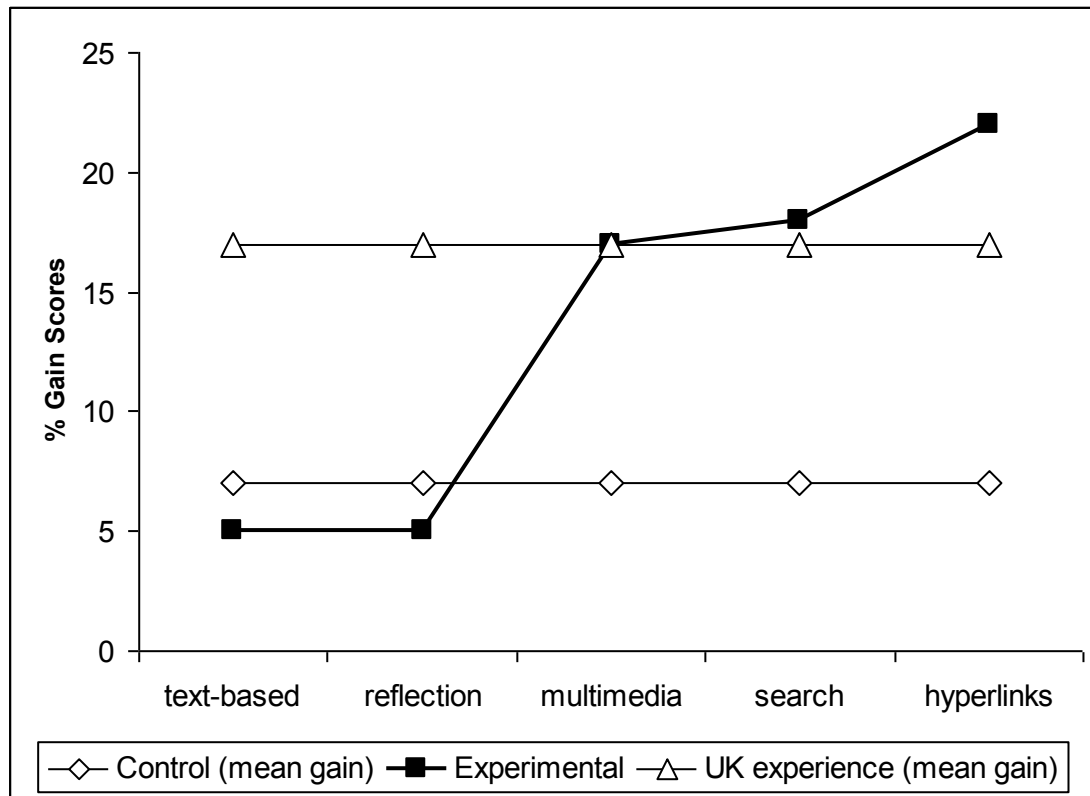


Figure 2: Comparative values on five measures of rhetorical style for the Chinese Writers Group [CMC], Chinese students of English (pre-experiment, C1 and E1 combined), Control Group (post-experiment, C1), Experimental E-learning Group (post-experiment, E1) and UK Writers Group [EUL], expressed as percentage of EUL Group scores

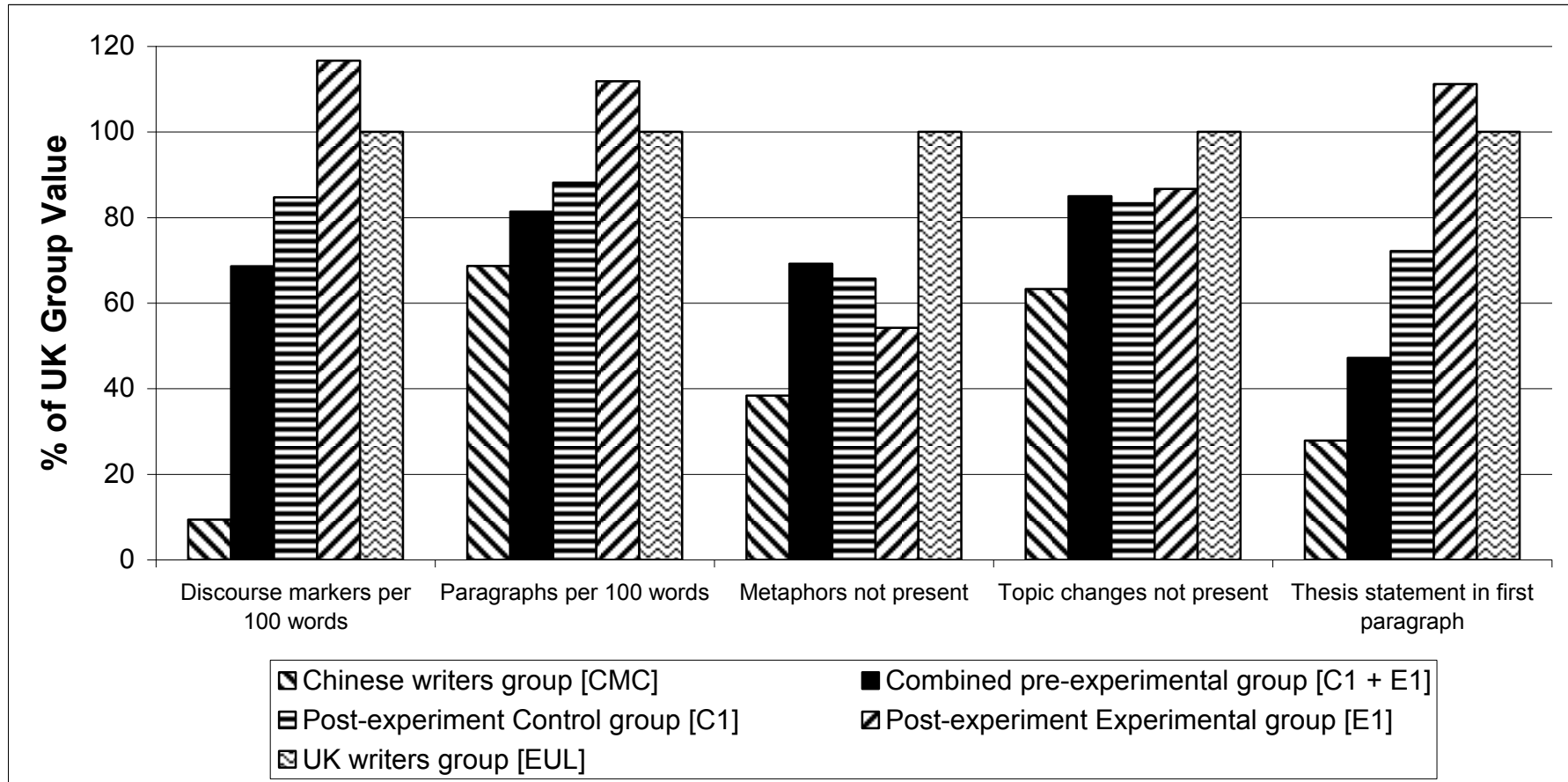


Table 1: Paired Samples t-tests, for comparisons for pre/post-test gains on test items associated with different pedagogic strategies (information; reflection; multimedia; hyperlinks; and search) for the Experimental Group

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	reflection - information	.0000	.94686	.17287	-.3536	.3536	.000	29	1.000
Pair 2	reflection - hyperlink	-1.0667	1.31131	.23941	-1.5563	-.5770	-4.455	29	.000
Pair 3	reflection - multimedia	-.7333	1.25762	.22961	-1.2029	-.2637	-3.194	29	.003
Pair 4	reflection - search	-.8333	1.14721	.20945	-1.2617	-.4050	-3.979	29	.000
Pair 5	hyperlink - information	1.0667	1.31131	.23941	.5770	1.5563	4.455	29	.000
Pair 6	information - multimedia	-.7333	1.08066	.19730	-1.1369	-.3298	-3.717	29	.001
Pair 7	information - search	-.8333	1.17688	.21487	-1.2728	-.3939	-3.878	29	.001
Pair 8	hyperlink - search	.2333	1.71572	.31325	-.4073	.8740	.745	29	.462
Pair 9	hyperlink - multimedia	.3333	1.39786	.25521	-.1886	.8553	1.306	29	.202
Pair 10	multimedia - search	-.1000	1.74889	.31930	-.7530	.5530	-.313	29	.756

Appendix 1: Note on ANOVAs and Bonferroni t-tests:

The research analysis made use of several statistical tests, including one-factor between subjects analysis of variance (ANOVA) for comparisons between groups; one-factor within subjects ANOVA, usually for pre- and post-test differences; and multiple Bonferroni t-tests, which were used to identify specific differences between pairs of scores, but only as confirmatory tests when the one-factor ANOVA test indicated statistical significance between subject groups. For ANOVAs the following details are reported:

example: $F(2,72) = 15.36, p < 0.001$

where	(2,72)	=	degrees of freedom
	15.36	=	value of F ratio [F-test]
	p<0.001	=	probability for F ratio [values of p<0.05 were considered to indicate statistical significance]