
Published 2012 by the
Higher Education Research and Development Society of Australasia, Inc
PO Box 27, MILPERRA NSW 2214, Australia
www.herdsa.org.au

ISSN 1441 001X
ISBN 0 908557 89 2

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A case study on providing international students the opportunity to enhance performance through online engagement

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International students who come from non-English speaking backgrounds (NESB) and are new to Australian university study can struggle with understanding information that is delivered verbally, particularly when delivered under the traditional lecture/tutorial or didactic approach. This can be compounded by large class numbers and cohorts dominated by local students who have grown up using English as their first language. This paper examines results by NESB students from Chinese universities who have studied the core unit of Professional Communication Practice in 2010 and 2011. These students came to the Lilydale campus of Swinburne University of Technology to complete Bachelor degrees under a collaborative articulated pathway program. The majority of these students have come from limited English-speaking environments. The paper analyses their results and uses contemporary literature to form conclusions on cognitive capabilities for the cohort when studying this introductory unit on-campus. The student results and literature review demonstrate that these NESB cohorts of students performed better when comprehending and consolidating knowledge delivered through interactivity involving text, or text-based content for instruction. This is particularly evidenced by the improved results for the second wave of NESB Chinese students, who were exposed to heightened “e-text based” transactional communication (based on a social media model), as opposed to a dominant ‘in-class verbal discussion’ mode of delivery.

Keywords: Non-English speaking backgrounds (NESB), E-learning, Hypertext

Introduction

This paper explores how online transactional communication can be used to stimulate discussion through simulating social media and enhance performance for Chinese students studying a core academic unit in communication in Australia.

Research has indicated that there is a strong correlation between cognitive ability and text-based learning for NESB higher education students (see literature review section). This case study aims to further demonstrate this relationship by analysing the results from Chinese students in a core communication unit who complete their bachelor degrees through a collaborative articulated...
pathway (CAP) program between specified Chinese universities and Swinburne University of Technology (SUT). The paper reviews results from the Professional Communication Practice unit and analyses these against finding from previous literature and a study (conducted by one of the authors) reviewing the performance of NESB and English Speaking Background (ESB) students with multi-media hypertexts.

The CAP program at Swinburne has been in operation for more than 10 years. In 2010 and 2011 two cohorts of business/commerce students from Nanjing University of Traditional Chinese Medicine (NUTCM) studied at the SUT Lilydale campus for 12 months. All NUTCM students must have achieved suitable scores in International English Language Test Score (IELTS) or Test of English as a Foreign Language (TOEFL) in order to study at SUT.

The unit examined for this paper is a core unit, which must be completed by all business and communication students enrolled through the Faculty of Higher Education Lilydale (FHEL). LPR100 Professional Communication Practice is a general unit that involves through its curriculum a high level of written and verbal English skills. Much of the learning and the assessment is based around using and understanding written and spoken professional English. The unit’s lectures and tutorial activities are delivered in English. For the FHEL CAP students, this is their introductory unit to the faculty.

In the past the convening lecturer noticed that NESB students often struggled with the content and assessment for this unit, based on its necessity for strong written and spoken English skills. Comprehension by NESB students in this unit was deemed to be more challenging due to the traditional lecture/tutorial pedagogical approach. The results from multimedia hypertext research on a cohort from this unit (see literature review), indicated that NESB students from Chinese backgrounds performed better in cognition of English-based curriculum content through text-based media. The unit was redesigned in 2011 to incorporate a blended delivery of tutorial discussion, using a social media approach to online discussion. This approach appeared to be well received by NESB students, with their comparative results improving considerably in 2011.

The blended approach adopted for the 2011 delivery of LPR100 Professional Communication Practice involved splitting discussion between text-based electronic discussion, through the University’s online learning platform - Blackboard, discussion through the social networking tool – Twitter, and classroom discussion for tutorials. In the preceding years, much of the tutorial discussion centred on face-to-face classroom discussion in small groups, meaning those who had more limited English comprehension skills were placed at a distinct disadvantage in tutorials. The deliberate inclusion of more text-based interaction and hypertext links was introduced to allow students to comprehend information and explore further knowledge in their own time.

It is believed that by providing e-text based social media style discussion, as part of a variety of delivery modes for information, CAP students will be less disadvantaged in the LPR100 curriculum by their limited English skills, and become more motivated to learn.

**Literature review**

**Defining terms**

A NESB person is defined as someone who was born in a non-English speaking country, or someone who was born in an English-speaking country with one or both parents from a non-
English speaking country (Oxford English Dictionary Online, 2008). All the CAP students who were enrolled in the LPR100 unit had come from NESB environments, with many of the students having very limited involvement with the English language. For the purpose of this paper the terms ‘English as a second language’ (ESL) and NESB are used interchangeably.

E-Learning is defined as involving the use of electronic devices to deliver, facilitate or encourage interaction for the purpose of providing instruction, knowledge and training (Clark, 2008; Karrer, 2007). E-learning is considered a learner-centred approach that allows students to utilise technology in order to access vast resources and have greater control over the pace, methods and routines for learning (Holmes & Gardner, 2006; Rosenberg, 2001; Spiro & Jengh, 1990). E-text refers to electronic files that serve the same purpose as traditional printed text, with hypertext being e-text which is crossed linked to various digital resources (Wang & Verezub, 2011).

Hypertext is, in general, described as an electronic reading and writing space (Inman, 2000). Hypertexts are often non-linear, which are organised similarly to the traditional hard-copy texts allowing reading. However, hypertext resources are able to provide the users more interactive experiences than traditional ones. A hypertext is cross-linked to various digital resources. A user can follow a clickable hyperlink to other web pages or another document when interacting with a hypertext.

Multimedia is defined as ‘the combination of various digital media types, such as text, images, sound and video, into an integrated multisensory interaction or presentation to convey a message or information to an audience’ (Neo & Neo, 2001, p. 20). Multimedia technologies have been used to reinforce knowledge in the educational environment (Sloane, 2005). Multimedia pedagogy incorporates the use of multi-media file formats combining various digital media types (text, images, sound, animation, video etc.) integrating multisensory interaction into the cognitive process (Neo & Neo, 2001). Multimedia pedagogy usually includes computer technology.

Cognition refers to the mental processes involved in gaining knowledge and comprehension, including thinking, knowing, remembering, judging and problem-solving. These are known as higher-level brain functions and encompass language, imagination, perception and planning (Cherry, 2011). Thomson and McGill (2008) simplify cognition into a finite ability to comprehend content from seeing and hearing. Cognitive style, according to Kozhevnikov (2007) refers to consistencies in an individual’s manner of cognitive functioning, particularly with respect to acquiring and processing information. Cognitive styles are not culturally or nationality assigned functions, but can be influenced by the effectiveness of information processing methods of students, for example NESB students and a preference for visual or auditory channels (Ramburuth & McCormick, 2001).

Social media includes web-based applications and mobile technologies used to turn communication into interactive dialogue, allowing the creation and exchange of user-generated content (Kaplan & Haenlein, 2010). Social media is media for social interaction beyond social communication. Social media has substantially changed the way organisations, communities, and individuals communicate, being particularly relevant to higher education students (Harris, 2008).

**NESB students’ learning**

Many students who rate well on English standardised testing struggle to comprehend academic content delivered in English, especially when presented through the auditory channel (Carstairs,
Myors, Shores, & Fogarty, 2006; Dodigovic, 2002; Kasper et al., 2009). For NESB students studying in a foreign country this poor comprehension is often compounded by accents, colloquial terminology, diverse assessment processes, discipline–specific vocab and rapid aural delivery (Kasper et al., 2009). English language proficiency significantly influences a NESB student’s cognition with visual and auditory comprehension (Bretag, Horrocks, & Smith, 2002; Carstairs et al., 2006). In addition to this for Chinese students, is the challenging verb system for the English language compared to native Asian languages (Dodigovic, 2002). Considering this literature, many NESB students from China will struggle with curriculum content delivered through a traditional didactic approach, especially in a over-lecturing pedagogy (Kirkwood, 2010; Ramburuth & McCormick, 2001).

Pedagogy for NESB students needs to address both linguistic and academic needs, as many find interpersonal communication challenging due to a lack of cohesive texture to their English vocabulary (Dodigovic, 2002; Kasper et al., 2009). Language background is one of the key issues which can influence a learner’s cognition, and cognitive style, during the learning process (Wang & Verezub, 2010). For this reason, a more suitable approach to pedagogy needs to be considered in order to provide a more equal opportunity for CAP students to perform to their optimum abilities. Many studies have anecdotally and empirically demonstrated that visual ‘content-based’ instruction effectively increases English language proficiency for NESB students, enabling them to participate more fully in the complex academic and social environment of Australian universities (Carstairs et al., 2006; Kasper et al., 2009).

Research conducted by Bretag et al. (2002) provides a collection of academic learning strategies to aid the comprehension for Chinese students studying in Australian universities. These strategies include: an interactive student-centred tutorial approach, opportunity for peer tutoring and peer discussion, facilitate students’ access to text information, develop strategies to compensate for students’ lack of English language fluency, and provide opportunities for students to use their English writing skills for non-assessment tasks. The use of text-based online communication is one method of including these strategies into the curriculum.

Another consideration is the use of multi-media though hyperlinks to accommodate diversity in learning styles for ESB students. Mayer (2003) draws a cognitive theory of multimedia learning that interprets the cognitive processing of a multimedia presentation.

![Figure 1: A framework for a cognitive theory of multimedia learning (Source: Mayer, 2003, p.129)](image)
Figure 1 illustrates how learners’ process a multimedia presentation. There are several steps that help learners to build relationships between the presented multimedia information and their prior knowledge: receiving words and image sources by ears and eyes at sensory level, selecting and forming the received materials at mental level; and organising the selected materials, then connecting them with the learners’ prior knowledge (Mayer, 2009).

**Swinburne University Multimedia Study**

A study was conducted in 2010 of LPR100 students to measure comprehension in the learning process for ESB and NESB students, with the majority of NESB students being CAP students. The study aimed to examine the effects of different multimedia formats in an active learning process. NESB students who participated in the study were asked to read and comprehend various multimedia materials (one per session) presented in the hypertext format. These hypertexts contained different types of media links, including image links, audio links, video links, animation links and text links.

Seventy NESB students who commenced their first year Bachelor of Media and Communication courses at Swinburne University of Technology (SUT), Lilydale campus, along with 180 ESB students, were invited to participate in the study. Tasks using a multimedia format (e.g. audio link, video link) were integrated into the LPR100 curriculum in line with tutorial and lecture content. However, the final number of participants who completed the seven sessions in full was 27. Others withdrew from the project or did not complete tasks to the required stage for various reasons.

It was hypothesised that the students would show maximum performance of interactivity with hypertext with text links (Wang & Verezub, 2010).

The findings from this research provided support for the hypothesis. They demonstrated that while reading hypertexts with different media formats, the format of instructional materials influenced students’ reading comprehension. When interacting with a multimedia task, the visual and audio stimuli are encoded by two cognitive sub-systems respectively: visual channel and audio channel (Wang & Verezub, 2010). Psychological research has shown that audio information is in fact more easily to be comprehended when presented together with visual information rather than that presented separately (Mayer, 1997, 2009). However, language probably is one of the key issues that affect the students’ cognitive processes during the learning processes. Carstairs et al. (2006) pointed out that NESB individuals tend to show a disadvantage in listening-related subtests due to a lack of proficiency in English. Thus, hypertexts with audio links would probably reduce the interactivity while reading hypertext with audio links. Overall, the collected data indicate support for the hypothesis that NESB students would show maximum performance of interactivity with hypertext containing text links (see Appendix One).

**NESB and e-text**

The above literature and research have indicated that Chinese CAP students have the opportunity to enhance their performance in LPR100 through the use of online discussion and networking technology. The principles of the knowledge economy mean that active online learning is paramount to success, and success is dependent upon engagement and producing knowledge, according to Kirkwood (2010). Online discussion provides NESB students a safety framework in which to engage through text, without the fear of feeling inept in spoken English during verbal discussion.
A vast number of today’s adolescents have become capable ‘digital natives’, who already possess the necessary skills and ability to participate in online discussion through communication technologies, so e-text should be utilised to promote unbridled engagement (Grenfell, 2010; Altun, 2003). These capabilities have instilled a degree of confidence in both NESB and ESB students to operate in this space at an academic level (Kirkwood, 2010; Harris, 2008). One of the tasks for the unit convenor who oversees cohorts of international students, is to provide a pedagogical platform that enables all students the opportunity to engage with the curriculum at a meaningful level; and an online discussion forum does this for CAP students studying LPR100 (Dodigovic, 2002; Kirkwood, 2010; Grenfell, 2010). Integral to the success of an online discussion forum is the educator’s role, which is to introduce and support peer-assisted knowledge sharing in an active and collaborative process (Grenfell, 2010).

The use of e-text is deemed acutely important to encouraging critical exchange and academic development, according to Harris (2008). Online engagement and the use of hyperlinks expand the dialogue outside of the classroom and build better communication channels and broader opportunity for learning (Bretag et al., 2002; Harris, 2008). The added advantage of this personal learning environment is that educators cede some of the control of the direction of the learning, making the students part of the curriculum development (Kirkwood, 2010; Kasper et al., 2009). This also decreases student passivity associated with student lecture hall type of delivery, particularly for ‘shy’ NESB students (Kirkwood, 2010).

The use of e-text in online curriculum allows for the students to engage with hypertext and multi-media through information sharing, providing the participating students the opportunity to learn through a variety of channels (Altun, 2003; Bretag et al., Dror, 2008; Jonassen, 2000; 2008). NESB students who believe their spoken English is restrictive feel more comfortable interacting and learning through e-text discussion (Bretag et al., 2002; Harris, 2008; Scroggins, 2001; Wang & Verezub, 2010). Hewings (2001) suggests many NESB students who are given the opportunity to write in expanded text can produce better quality work than through spoken or e-mail text.

Therefore, as a cognition tool, e-text, hypertext and multimedia has the potential to extend learner’s cognitive function in the learning process, therefore the quality of learning and teaching can be significantly enhanced through the use of online discussion and web-based technology (Bretag et al., 2008; Dror, 2008; Jonassen, 2000; Wang & Verezub, 2010).

**LPR100 curriculum changes**

Based on the results of the Multimedia study of the Swinburne CAP students studying LPR100 in 2010, and the findings of the literature exploring e-text and NESB learning, a blended model of pedagogy was introduced into the LPR100 2011 on-campus curriculum.

The structure of the delivery of the LPR100 unit content was changed to a blended model, where in-classroom discussion introduced topics, principles and theories, which were then expanded upon over the course of the week through the Blackboard ‘Discussion Board’ function. This enabled students to expand on classroom discussion via e-text and hyperlinks. The weekly lecture remained as a one-hour lecture hall style of delivery, but was recorded and loaded onto the Blackboard site for the unit (as has been the case for many years). Readings associated with the weekly topics were either from the prescribed text, or available through the online library access.
A deliberate attempt was made to prescribe on-line activity in line with social media principles. However, some refined guidelines were also included in the ‘Directions for Online Discussion’. Some of these included: keeping postings a maximum of 300 words; encouraging the use of relevant hyperlinks; encouraging the use of academic referencing; discouraging the use of ‘Internet Slang’ (online phrases, abbreviations, acronyms and idioms) (Boyd & Ellison, 2007); and, reminding students of their commitment to positive engagement within the unit. The discouragement of internet slang and text-heavy postings was of particular importance to both local and CAP students as they had to produce meaningful and comprehensible writing. Twitter was also used as a means of communicating, but was more specific to introducing key ideas into the discussion and for administration purposes.

The combined classroom and on-line discussion formed 45% of the assessment marks for the unit. A marking guide was provided to the students indicating posts would be assessed on their: quality of information; relevance; judicious use of hypertext and references; building on the discussion from previous participants; and, contributing positive knowledge to the discussion. Another 20% of the assessment marks was an online test, individually completed and conducted under exam conditions.

**LPR100 results for 2010 and 2011 students**

The following results (Table 1 and Table 2) refer to student grades for the semester two 2010 and semester two 2011. The results are not inclusive of semester one student grades as the CAP cohort began their FHEL study in semester two in each of these years.

**Table 1: LPR100 semester 2 2010 grade results**

<table>
<thead>
<tr>
<th>Semester 2, 2010 results</th>
<th>NESB (Chinese CAP Cohort)</th>
<th>% of grade made up of CAP students</th>
<th>Other Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (Fail – below 50%)</td>
<td>2</td>
<td>22%</td>
<td>7</td>
</tr>
<tr>
<td>P (50%-64%)</td>
<td>22</td>
<td>23%</td>
<td>75</td>
</tr>
<tr>
<td>C (65%-74%)</td>
<td>30</td>
<td>29%</td>
<td>75</td>
</tr>
<tr>
<td>D (75%-84%)</td>
<td>5</td>
<td>16%</td>
<td>27</td>
</tr>
<tr>
<td>HD (85%-100%)</td>
<td>0</td>
<td>NA</td>
<td>0</td>
</tr>
</tbody>
</table>

**Table 2: LPR100 semester 2 2011 grade results**

<table>
<thead>
<tr>
<th>Semester 2, 2011 results</th>
<th>NESB (Chinese CAP Cohort)</th>
<th>% of grade made up of CAP students</th>
<th>Other Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (Fail – below 50%)</td>
<td>1</td>
<td>8%</td>
<td>12</td>
</tr>
<tr>
<td>P (50%-64%)</td>
<td>18</td>
<td>31%</td>
<td>40</td>
</tr>
<tr>
<td>C (65%-74%)</td>
<td>15</td>
<td>27%</td>
<td>40</td>
</tr>
<tr>
<td>D (75%-84%)</td>
<td>11</td>
<td>33%</td>
<td>22</td>
</tr>
<tr>
<td>HD (85%-100%)</td>
<td>1</td>
<td>20%</td>
<td>4</td>
</tr>
</tbody>
</table>
There were 59 CAP student enrolments in the LPR100 unit for semester two, 2010, and 46 CAP student enrolments for 2011. In terms of marks for semester two 2010, no CAP student achieved a top 10 result and only two CAP students were in the top 20 results. However, results for semester two 2011, when a blended approach incorporating text-based electronic discussion to learning was introduced, eight CAP students featured in the top 20 results, with one student finishing fourth overall, just two full marks behind the best performing student.

In 2010, nine of the bottom 25 students were CAP students, and in 2011, seven CAP students were in the bottom 25 students. In 2011, 26% of the CAP students scored a mark of 75% or above, while in 2010 only 8% scored above 75%. Another interesting recording is that during the 2011 semester two, the CAP students contributed 40% of the posts on discussion board for tutorial discussion, but made up only 29% of the LPR100 cohort. The CAP students contributed an average 47 posts per student (or five posts a week), compared with an average post of 14 posts (or two posts a week) from the rest of the unit cohort. Further to this result, CAP students performed much better with the online assessment test in 2011 than in 2010. In 2011, 16 results of the top 20 results from the online test were from CAP students, while in 2010 there were only eight CAP students.

Analysis and discussion

A snapshot of the LPR100 results for CAP students and other students shows that the performance for the 2011 CAP students appears only marginally better against the 2010 CAP students, with 98% and 97% passing respectively. However, in comparing the results from 2010 against 2011, the significant results relate to the number of distinction (D) and higher distinctions (HD) for the CAP students. In 2010 only five CAP students scored above 74 marks, while in 2011 12 CAP students achieved this. Considering the changes to the curriculum through the introduction of e-text as a considerable part of the assessment process, the above results correlate well with previous research conducted on learning diversity for Chinese students in Australia (see particularly: Ramburuth & McCormack, 2001; Bretag et al., 2002). Asian students appear to function less effectively with auditory learning, compared to Australian students, who indicated a preference for this mode of learning (Ramburuth & McCormack, 2001).

The results also demonstrate the 2011 CAP students’ stronger preference for participating in discussion online compared with the other students, making up 40% of all online posts, or on average five posts a week, even though they only made up 29% of the LPR100 cohort. Closer examination would indicate that some CAP students far exceeded the five posts, and there were those CAP students who did not participate at all, or contributed very few posts. A deeper examination also indicates that many of CAP students were multiple visitors to the Discussion Board over the course of a week, compared with other students who had single and very short-span visits in order to complete their postings. This would suggest that many of the CAP students engaged with the online text and discussion more regularly than other students. These findings are similar to what Harris (2008) suggests that online engagement assists in persistence in study and ability to achieve at a higher level, which indicates CAP students heightened engagement through e-text and hyperlinks has resulted in improved results.

The impressive final test results of the 2011 CAP cohort, being 16 out of the top 20 test marks were CAP students, align with the literature reviewed above relating to the NESB students (particularly Chinese students) preference for e-text and text hyperlinks as a means of engaging in discussion and independent learning (see particularly literature by: Chi, 1995; Clark, 2008;

A final consideration for discussion regarding the CAP student performances is addressing the common held belief amongst Australian universities that Asian students perform better in rote learnt assessment. When considering the degree on increased online engagement and discussion for the 2011 CAP students (Chinese) compared with other students, this appears to indicate their preference for the inclusion of collaborative and peer–assisted learning in the curriculum. This echoes similar finding by Australian university research, including Ramburuth and McCormack (2001), Bretag et al. (2002), Wang and Verezub (2010), and Kirkwood (2010). Such findings indicate that Chinese students respond well to social constructivist learning principles and enjoy the sharing of past experiences and knowledge, as with western student (Grenfell, 2010).

Reflecting on the CAP students results by comparing the 2010 and 2011 LPR100 cohorts, and by comparing with other LPR100 students, it demonstrates that a stronger online engagement following the principles of social media have effected stronger performances by the NESB Chinese students in this unit.

Summary and conclusion

It can be concluded from the above results that Chinese CAP students who are classified as NESB performed better in their assessment for LPR100 Professional Communication Practice unit in 2010 and 2011 due to the introduction of more e-text and hypertext learning opportunities simulating social media introduced into the unit in 2011.

The CAP student results for the LPR100 unit in 2011 indicate a marked improvement over the results for the 2010 CAP cohort. The 2011 cohort studied the unit through the new blended learning curriculum, which included considerable online discussion using e-text, hypertext and multimedia. In keeping with previous research findings, the CAP students appeared to respond better to the more independent learning environment of online discussion in social media mode. The 2011 CAP students made significant contributions to the online discussion forums and many performed exceptionally well in the online test.

This conclusion is supported by the reviewed literature that indicated Chinese students studying in Australian universities have enhanced cognition for English text when given the opportunity to engage with the text at a more independent and meaningful level through online discussion and hyperlinks (Ramburuth & McCormack, 2001; Bretag et al, 2008, Wang & Verezub, 2010; Kirkwood, 2010). The broader literature relating to NESB students and online engagement also support these finding, highlighting the facts that: students are typically ICT savvy; thrive more in their learning when they have independent control over the text; feel less intimidated by online English text as opposed to auditory English leading to more critical exchanges; e-text, hypertext and online multi-media provide the diversity in pedagogy that allows different learning styles to be engaged (see for example: Altun, 2003; Chi, 1995; Clark, 2008; Gunderson 2009; Harris, 2008; Hewings, 2001; Karrer, 2007; Scroggins 2001).

There are many limitations to drawing a significant conclusion to the above study. A comparison of results over many years for the introduction of blended LPR100 curriculum would provide a stronger indication of the effects of e-text on CAP student learning. There is also the consideration of the evolution of the development of the online curriculum, and how this may
affect the results. A stronger comparison of the breakdown of assessment regarding online and traditional written text between other students and CAP students would provide deeper insight into the effectiveness of e-text pedagogy for CAP students’ overall learning.

However, this case study has provided an indication that e-text, hypertext and multimedia can have a positive effect on learning for Chinese students. It follows the development that many tertiary educators and education designers are proposing more open-ended, learner-centric, flexible learning platforms, through innovative learning tools on the web (Kirkwood, 2010). It has also gone someway to supporting the theory that when language comprehension is not an issue, many Asian undergraduate students perform better in academic study than local students (Volet, 1999).

References


**Appendix One**

Swinburne Multimedia Study (taken from research conducted by PhD student Xinyang Wang in 2010).

**Methodology**

**Participants**
Seventy NESB students who commenced their first year Bachelor of Media and Communication courses at Swinburne University of Technology (SUT), Lilydale campus, were chosen to participate in the study. However, the final number of participants was 27. Others withdrew from the project for various reasons.

**Procedures and data collection**
The study aims to examine the effects of different multimedia formats in an active learning process. NESB students who participated in the study were asked to read and comprehend various multimedia materials (one per session) presented in the hypertext format. These hypertexts contained different types of media links, including image links, audio links, video links, animation links and text links. It was hypothesised that the students would show maximum performance of interactivity with hypertext with text links. The structure of each reading session is shown in Table 1.
Table 1: Design of hypertext-based learning program

<table>
<thead>
<tr>
<th>Session no.</th>
<th>Text length in words</th>
<th>Type of links</th>
<th>Number of links</th>
<th>Tasks (questions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>1000-1500</td>
<td>Image</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>S2</td>
<td>1000-1500</td>
<td>Audio</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>S3</td>
<td>1000-1500</td>
<td>Video</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>S4</td>
<td>1000-1500</td>
<td>Animation</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>S5</td>
<td>1000-1500</td>
<td>Text</td>
<td>5</td>
<td>9</td>
</tr>
</tbody>
</table>

Table 1 shows the structure of the 5 reading sessions. They were designed to be delivered over five 1 hour sessions on a weekly basis in Semester 2, 2010. The texts of all session were of the same length and had the same number of links. The readability levels were same for all hypertext reading materials, as the contexts presented were written based on the reading materials that matched the participants’ undergraduate level of study. The students had to answer 9 comprehension questions after reading each hypertext.

Results

The means, standard deviations, skewness and kurtosis for the five types of hypertexts are shown in Table 2. It illustrates the data collected from the reading comprehension tasks. Mean score of hypertext with text (text S5) links is the highest of all five texts.

Table 2: Sample size, mean, standard deviation, skewness and kurtosis for scores of reading hypertext supplemented by different media links

<table>
<thead>
<tr>
<th>Session no.</th>
<th>Type of reading materials</th>
<th>n=27</th>
<th>Mean</th>
<th>SD</th>
<th>Max.score</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>HT-image links</td>
<td>5.04</td>
<td>0.771</td>
<td>6.00</td>
<td>0.71</td>
<td>-0.889</td>
<td>-0.246</td>
</tr>
<tr>
<td>S2</td>
<td>HT-audio links</td>
<td>4.81</td>
<td>0.752</td>
<td>6.00</td>
<td>0.71</td>
<td>-0.269</td>
<td>-0.856</td>
</tr>
<tr>
<td>S3</td>
<td>HT-video links</td>
<td>4.85</td>
<td>0.501</td>
<td>5.75</td>
<td>0.71</td>
<td>0.038</td>
<td>-0.777</td>
</tr>
<tr>
<td>S4</td>
<td>HT-animation links</td>
<td>4.62</td>
<td>0.582</td>
<td>5.75</td>
<td>0.71</td>
<td>-0.222</td>
<td>-0.371</td>
</tr>
<tr>
<td>S5</td>
<td>HT-text links</td>
<td>5.47</td>
<td>0.573</td>
<td>6.25</td>
<td>0.71</td>
<td>-0.991</td>
<td>0.807</td>
</tr>
</tbody>
</table>

Note. NESB= non-English speaking backgrounds; SD=standard deviation; HT=hypertext.

The influence of hypertext formats on hypertext comprehension was analysed using paired sample t-test. The results show (Table 3) that different types of hypertexts (containing image links, audio links, video links, animation links and text links) influence NESB students’ reading comprehension. There is a significant difference between comprehending of hypertexts with image and text links in S1 and S5; also the difference is significant between students’ comprehension of hypertexts with audio and text links in S2 and S5; as well as hypertexts with video and text links in S3 and S5; hypertexts with animation and text links in S4 and S5; and a significant difference between reading of hypertexts with image and animation links in S1 and S4.
Table 3: The influences of different types of hypertext on reading comprehension

<table>
<thead>
<tr>
<th></th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1 – S2</td>
<td>1.945</td>
</tr>
<tr>
<td>S1 – S3</td>
<td>1.166</td>
</tr>
<tr>
<td>S1 – S4</td>
<td>3.427**</td>
</tr>
<tr>
<td>S1 – S5</td>
<td>-4.058**</td>
</tr>
<tr>
<td>S2 – S3</td>
<td>-0.250</td>
</tr>
<tr>
<td>S2 – S4</td>
<td>1.381</td>
</tr>
<tr>
<td>S2 – S5</td>
<td>-4.532**</td>
</tr>
<tr>
<td>S3 – S4</td>
<td>1.718</td>
</tr>
<tr>
<td>S3 – S5</td>
<td>-4.237**</td>
</tr>
<tr>
<td>S4 – S5</td>
<td>-7.616**</td>
</tr>
</tbody>
</table>

** p<0.01 level (2-tailed); *p<0.05 level (2-tailed)