Effects of Multimedia Vocabulary Annotations on Vocabulary Learning and Text Comprehension in ESP Classrooms

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Abstract. For the past few decades, instructional materials enriched with multimedia elements have enjoyed increasing popularity. Multimedia-based instruction incorporating stimulating visuals, authentic audios, and interactive animated graphs of different kinds all provide additional and valuable opportunities for students to learn beyond what conventional instruction relying mainly on print material can afford and achieve. Cognitive load theory, Sweller, Van Merrienboer, & Paas (1998) and Mayer's (2001) theory of multimedia learning, have suggested that replacing visual text with spoken text (i.e., modality effect) result in better learning outcomes and that less mental efforts would be required to learn the multimedia lessons. The aim of this study was to test the generalizability of the modality effect in animation-based multimedia instruction developed for learning English-for-specific purposes (ESP) in an EFL classroom. Specifically, the study investigated the effect of spoken (audio) annotation and text annotation embedded in a concurrent on-screen text accompanying computer-generated animations that depicts the process of blood flow in a human heart. The study also looked into the impact of language of the annotation (i.e., students' L1 vs. L2) and interactive effect of language proficiency and prior knowledge and above independent variables on the learning outcomes and cognitive load. Results indicated no significant differences between L1 and L2 glosses for all tests. Additionally, no significant differences were also found between audio and text annotations in all tests. However, L2 annotation significantly added more difficulties to the comprehension of the annotations than L1.

Keywords: multimedia annotation, ESP.

1. Introduction

The use of computers as well as technology-related applications have significantly affected every aspect of human life, including how we receive and deliver

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knowledge. Nowadays, people do not rely purely on print material as their major source of readings. Readings on the Internet, from PDAs or other electronic devices make a reading experience more enjoyable and move beyond a traditional linear fashion. Hypermedia links provided in selected nodes lead the readers to other nodes or links that provide extra information on the original nodes (Ariew & Ercetin, 2004). This "nodes and links" feature of hypertext provides potentials for designing more flexible and richer access to conventional linear reading material for which a predetermined fashion of viewing is adopted. Information accessed via nodes or links can be used as supplementary material to further understand a topic or could act as an aid to further explain a difficult concept.

With the advent of the technology information era, media of various types have been employed to assist learning of different kinds. However, several decades of research on multimedia facilitated or assisted learning have not been able to conclude that multimedia application is any better than conventional instruction without the aid of multimedia. Nevertheless, the technology era has arrived and deeply intertwined into every aspect of human living, it is not an issue to adopt or not to adopt certain technology but how to effectively adopt technology so that it would benefit human beings in every area.

Annotations have been used for several decades to assist reading comprehension. Annotations could occur as marginal notes or at the end of reading selection for readers to refer to when they experience difficulties in the reading process (Ariew & Ercetin, 2004; Hullen, 1989). Annotations could be developed in multiple forms such as text (verbal), audio or visual or a combination of these three. Also, in ESL/EFL texts, annotations could be provided in either students' target language or mother tongue.

Research on annotations in ESL/EFL for general English learning purposes has generally concluded that annotations of different types have promoted students' comprehension of the reading materials or at least are equally effective as when none are provided. Under what conditions, though, would annotations of different types promote English reading for specific purposes has rarely been discussed in the literature. Issues like when do multimedia material embedded with different forms of facilitation hinder learners' process of professional readings are not conclusively settled.

In addition, do learners with individual differences in their language ability or prior knowledge associated with the subject matter receive different types of multimedia annotations equally or differently? Do different forms of annotations induce cognitive load differently? The purpose of the study was to compare the effect of audio and textual annotations in the form of either L1 or L2 on EFL students' learning from professional reading and induced cognitive load. Additionally the study explored the effect of individual difference, i.e., language proficiency and prior knowledge of the subject matter on above dependent variables.

2. Method

2.1. Participants

The participants were 100 undergraduate students (78 females and 22 males) who were enrolled in a college of humanities at a teacher-development university in Taiwan. None of the students were native speakers of English and had received at least 7-10 years of formal English education. Students' ages were between 19 and 25. The students participated in the study voluntarily but were individually awarded a NT$400 book coupon after the study for their participation. Participants in this study were considered to be intermediate achievers and had passed an intermediate level of General English Proficiency Test (GEPT), an official general English ability test developed by The Language Training and Research Centre in Taiwan.

2.2. Materials and apparatus

The materials consisted of a multimedia animation program developed using Microsoft Flash. It presented a multimedia text illustrating general physiology knowledge on the functions of the human heart developed by Dwyer (1972). The reading text consisted of 2,000 words in English, presented in 20 pages. The 20 pages were further divided into 5 topics. Each topic consisted of approximately 200-300 words. The topic and page number were presented on the right side of the screen. Students were able to view their progress in the reading from the page numbers.

3. Discussion

Drawing on Mayer's (2001) split-attention effect, which is consistent with a dual-processing model of working memory, the study tested the hypothesis that annotations in the form of audio would be more effective than visual (textual) in enhancing vocabulary learning and reading comprehension of ESP material. Additionally, the study explored the amount of cognitive load experienced by learners when interacting with different types of annotations. Interactive effects of level of annotation language/medium and learners' language proficiency and background knowledge of the ESP material were also diagnosed to figure out if they were additional factors that might co-explain the effect of annotations on students' learning of ESP materials. The major findings can be summarized as following. First, students learned equally well from ESP material with annotations that used either their native or target language or delivered in the form of text or audio. Second, language proficiency was an important factor that would influence students' learning from ESP material supported by annotations. High language proficiency students performed consistently and significantly better than their counterparts both in vocabulary acquisition and reading comprehension. Third, although types of annotations did not differentiate effects on learning outcome, different types of annotations did result in various amounts of cognitive loads. Annotations developed

using students' target language (i.e., English in this study) significantly added more difficulties to the comprehension of the annotations than annotations using students' native language. Fourth, annotations in audio form resulted in more cognitive load associated with the difficulties of the annotations than visual (textual) form. Fifth, low proficiency students experienced higher cognitive load associated with difficulties of the annotations than high proficiency students. Sixth, students consistently have a preference for annotations provided in their native language and in visual (textual) form, which they also found to be more useful.

4. Conclusions

The results of the study did not show any significant differences in vocabulary recall and text comprehension between the annotations developed using students' native language (Chinese) and their target language (English). This result is consistent with Yoshii's (2006) study, Jacobs, Dufon, and Hong's (1994) study, and Chen's (2002) study. However, previous studies conducted on whether glosses should be designed using L1 or L2 have produced mixed results. According to Bell and LeBlanc (2000) and Hayden (1997), students relied on L1 glosses more than L2 glosses because the former are more efficient in resolving their immediate lexical needs when reading a foreign text. When students are given the choice between L1 and L2 glosses, L2 glosses are seldom used (Bell & Leblanc, 2000; Davis & Lyman-Hager, 1997; Goyette, 1995; Hayden, 1997).

The self-reported data using a questionnaire in this study reconfirmed the finding that students like L1 glosses more than L2 and that L1 glosses are more useful than L2 in assisting with the comprehension, although the results in tests found no significant differences. Although annotations in the format of L1 did not add in more learning gains, annotations developed using L2 significantly added more difficulties to the comprehension than annotations using L1. This finding is not surprising because L2 annotation needs further interpretation and must become comprehensible to the learners before they can be used to assist vocabulary recall or text comprehension. The encoding process is actually conducive in potential extraneous cognitive load, but not germane load because it has not resulted in greater learning gains and performance of the learners. Extraneous cognitive load is the extra load resulting from poor instructional design. The level of extraneous cognitive load is determined by the format and manner in which the instructional material is presented and by the amount of capacity that working memory is used when learners engage in the instructional activities (Sha & Kaufman, 2005). It is suspicious that annotations in students' L2 have actually induced extraneous cognitive load by distracting students from performing irrelevant information coding or hypothesis-testing, i.e., meaning-making.

This suspicion was further supported by the finding that cognitive load associated with annotations did not correlate significantly with any level of learning in this study.

The finding of no significant differences between L1 and L2 annotations in facilitating vocabulary acquisition and reading comprehension has extended our understanding of equal or non-differential roles of language annotations played in conventional ESL/EFL reading to ESP reading. Furthermore, the same finding was further extended to annotations that developed to assist text comprehension which was contextually enriched through animation.

References

Ariew, R., & Ercetin, G. (2004). Exploring the potential of hypermedia annotations for second language reading, *Computer Assisted Language Learning, 17*(2), 237-259. doi: 10.1080/0958822042000334253

Bell, F., & LeBlanc, L. (2000). The language of glosses in L2 reading on computer: Learners' preferences. *Hispania, 83*(2), 274-285.

Chen, H. (2002). *Investigating the effects of L1 and L2 glosses on foreign language reading comprehension and vocabulary retention*. Paper presented at the annual meeting of the Computer-Assisted Language Instruction Consortium, Davis, CA.

Davis, J. N., & Lyman-Hager, M. A. (1997). Computers and L2 reading: Student performance, student attitudes. *Foreign Language Annals, 30*(1), 58-72. doi: 10.1111/j.1944-9720.1997.tb01317.x

Dwyer, F. M. (1972). *A guide for improving visualized instruction*. State College, PA: Learning Services, The Pennsylvania State University.

Goyette, E. S. (1995). *The effects of dictionary usage on text comprehension*. (Unpublished Doctoral Dissertation). University of McGill.

Hayden, S. (1997). *An investigation into the effect and patterns of usage of a computer mediated text in reading comprehension in French*. (Unpublished Doctoral Dissertation). University of Pennsylvania.

Hullen, W. (1989). In the beginning was the gloss: Remarks on the historical emergence of lexicographical paradigms. In G. James (Ed.), *Lexicographers and their works* (pp. 100-116). Exeter: University of Exeter.

Jacobs, G., Dufon, P., & Hong, F. (1994). L1 and L2 vocabulary glosses in L2 reading passages: Their effects for increasing comprehension and vocabulary knowledge. *Journal of Research in Reading, 17*(1), 19-28. doi: 10.1111/j.1467-9817.1994.tb00049.x

Mayer, R. E. (2001). *Multimedia learning*. New York: Cambridge University Press.

Sha, L. S., & Kaufman, D. M. (2005). *Managing cognitive load while playing computer games*. Paper presented at the 2005 American Educational Research Association (AERA) Annual Conference.

Sweller, J., Van Merrienboer, J. J. G., & Paas, F. G. W. C. (1998). Cognitive architecture and instructional design. *Educational Psychology Review, 10*(3), 251-296. doi: 10.1023/A:1022193728205

Yoshii, M. (2006). L1 and L2 glosses: Their effects on incidental vocabulary learning, *Language Learning & Technology, 10* (3), 85-101. Retrieved from http://llt.msu.edu/vol10num3/pdf/yoshii.pdf

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