

Developing E-Books for Medical Vocabulary Learning: Psychiatric Drugs as Examples

Chi-Yun Hsiung

The MA Program in English Professional
Communication and Instructional
Technology
National Kaohsiung University of Applied
Sciences
ginnykuma@gmail.com

Shu-Chiao Tsai

The MA Program in English Professional
Communication and Instructional
Technology
National Kaohsiung University of Applied
Sciences
achiao@cc.kuas.edu.tw

ABSTRACT

The purpose of the research is to develop an e-book for nursing students or staff to learn pharmacological English vocabulary, mainly on psychotropic drugs. The development of the e-book was based on Mayer's multimedia learning theories and Chapelle's computer assisted language learning (CALL) principles, including various multimedia components such as text, graphics and audios. An online test system is also designed to provide learners to evaluate their learning effectiveness by themselves. The e-book was tried by 17 participants with nursing backgrounds; participants' positive responses indicated that most learners were satisfied with the e-book.

Keywords: Computer-assisted language learning (CALL), Multimedia learning, Specialized vocabulary, English for specific purposes (ESP), Psychiatric drugs

I. INTRODUCTION

In the field of nursing, the role of specialized vocabulary learning, including medical terminologies, pharmacological names, and colloquial words, has been found to be important for preparation of international students to function in the clinical settings [1]. While previous research has focused on medical terminology learning and the professional jargon used in the communication of nurses [2-3], little attention has been paid to pharmacological vocabulary learning in the discipline of nursing. Meanwhile, suggestions regarding the integration of pharmacological vocabulary teaching into nursing classes have been recommended only to address the problems of international students in learning pharmacological names [1]. Pharmacological vocabulary learning, especially trade names of drugs, on local nurse education might be overlooked in Taiwan. On the other hand, to communicate with medical teams and provide patients with accurate pharmacological information, nurses and nursing students are required to learn pharmacological English vocabulary and its related knowledge; otherwise, inadequate knowledge or misunderstanding may lead to severe medication errors [4].

To facilitate learners' performance on vocabulary learning, many researchers have studied the effects of integrating multimedia components such as graphics, audios, and text into computer-assisted materials [5-8]. The results from these studies have indicated that both the combination of text and graphics and the mixture of graphics and audios in vocabulary acquisition are effective. Applying multimedia annotations in a vocabulary learning environment, therefore, would be a beneficial approach to improving vocabulary. However, few products are available on the market to learn pharmacological English vocabulary with the aids of multimedia annotations. To bridge the gap, the present study focuses on developing an e-book for learning pharmacological English vocabulary which combines pictures and English audio to allow nursing students or nurses in Taiwan to study pharmacological English vocabulary in a motivating and friendly environment.

II. LITERATURE REVIEW

A. *English for Specific Purposes*

Developed in the 1960s, English for specific purposes (ESP) is known as teaching/learning English with a learner-centered approach to satisfy learners' needs in specific fields [9]. According to Harding [10], two elements of ESP have been identified: the purpose of using the language and the application of the language in a vocation. Based on the needs of various professions, ESP can be divided into minor categories such as EBP (English for Business Purposes) and EMP (English for Medical Purposes). The interest for the present study is to address the English needs of nursing students, related to EMP. EMP is designed to teach English for the needs of patients and medical staff, including physicians, nurses, and so on. Further, EMP can be classified as more specialized subjects such as English for Pharmacy and Nursing [11]. In nursing practice, English proficiency turns to be a major determinant of the quality of health care because the jobs entail nurses' using English to learn new knowledge and exchange information among multidisciplinary teams and patients [12]. To successfully communicate with professionals in

nursing careers, learning specialized vocabulary can be a primarily important step [2]. Although pharmacology is one specific field of nursing [1], little research has been focused on improving the acquisition of pharmacological English vocabulary in Taiwan.

B. Computer-assisted Language Learning

Computer has been applied to language education since the 1960s. Computer-assisted language learning (CALL) is defined as “the search for and study of applications of the computer in language teaching and learning” [13]. Based on previous research and practice, Lee [14] identified 8 advantages for using CALL: (1) providing students with opportunities to learn the information concerned with human experience on the web by themselves, (2) increasing students’ motivation, (3) enhancing students’ linguistic skills, (4) offering students authentic materials to study at their convenience, (5) allowing students to communicate with people around the world and interact with computers by receiving feedback from on-line exercises, (6) giving students an individualized and learner-centered learning environment, (7) preventing students from absorbing a single source of information, and (8) shortening the distance of communication through the Internet. Considering the benefits of CALL mentioned above, this study, therefore, adopts e-books as a medium to present teaching contents about the pharmacological English vocabulary. To enhance the effectiveness of vocabulary acquisition, following principles can be applied in designing CALL materials according to Chapelle’s [15] suggestions: (1) modifying the linguistic input by transferring written words into spoken words, and (2) giving learners chances to produce linguistic output and allowing them to identify their mistakes.

C. Multimedia Learning

Mayer’s cognitive theory of multimedia learning (CTML) [16] is one of the most common multimedia theories applied in the computer assisted language learning environments [8]. The core of CTML is to design multimedia messages based on the process of the operation of human mind. Fig. 1 shows the cognitive model of multimedia learning proposed by Mayer [16]. A multimedia presentation is defined as information such as words and pictures that humans receive from the outside world. Established on the dual-channel assumption, CTML has suggested humans separately process visual and auditory information in different channels. While printed text and pictures entering into humans’ sensory system are held as visual images, spoken words and other sounds presented to humans are stored as auditory images in the sensory system. Then, if people actively pay attention to the information, the visual and auditory images kept in the sensory system will go into the working memory and finally be structured into knowledge-visual and verbal mental models-through organizing the information. Specifically, humans process pictures in the visual channel and process

spoken words in the auditory channel. The processing of printed words, however, is more complex than that of pictures and spoken words. Printed words are firstly processed as visual images in the visual channel. Once people mentally pronounce the images of text, printed words are then entered into the auditory channel and processed like the spoken words.

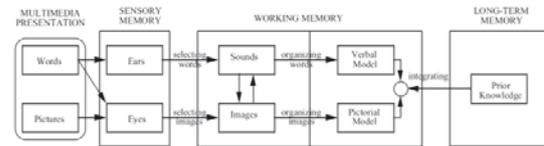


Figure 1. The cognitive model of multimedia learning [16].

The multimedia principle is thus formed based on CTML: learning with two formats of multimedia presentation is more effective than learning with one format. Presenting both words and pictures for learners creates an opportunity for them to construct verbal and visual mental models and establish a link between these two mental models. In contrast, learners who receive words only have the chance to build verbal mental models. However, according to the spatial contiguity principle also proposed by Mayer, corresponding words and pictures should be placed near each other for learners to simultaneously store the written and pictorial information in their working memory. Finally, multimedia principle also reveals some advantages of the provision of annotations for vocabulary acquisition [8].

D. Vocabulary Annotations

One of the major characteristics of multimedia that can be applied to vocabulary teaching is the ease of integration of different types of communicating media, including text, sounds, images, videos, and animations, into the presentation of information [17-18]. Evidence has shown that integrating additional multimedia annotations into vocabulary learning can enhance learning performance. For example, Rusanganwa [19] compared different means for teaching English technical vocabulary with 32 undergraduate students in Rwanda. One group of students was taught with multimedia presentation on the computer, whereas the other group was taught employing traditional methods with blackboard presentation. On a final test for vocabulary recall, the students in the multimedia-assisted teaching group scored significantly higher than the students in the traditional teaching group.

Besides, research has found the important role of visual annotations in vocabulary acquisition. For instance, Yeh and Wang [7] investigated the effects of different combinations of vocabulary annotations, including text, pictures, and sounds, on vocabulary learning. 82 EFL college students in Taiwan were included in the study and divided into three groups with different annotation conditions. The result indicated that the type with text plus picture was the most effective for vocabulary acquisition.

According to the previous research, pictures are useful mediums and the combination of written and pictorial annotations is more effective for vocabulary learning than the provision of only one type of annotations. However, little research is available on the effect of visual annotations used in other fields of vocabulary learning such as ESP vocabulary. Moreover, the role of other vocabulary annotations such as audio pronunciations has not been widely studied. An experiment was conducted with 72 beginner learners of L2 German by Rimrott [8] to investigate the effectiveness of vocabulary annotations, including glosses, pictures, audio pronunciations, and definitions, in five different combinations. The result suggested that both pictorial and audio annotations, respectively, were beneficial for L2 vocabulary acquisition and that the combination of pictures and sounds would be the top priority when multiple annotations could be provided for vocabulary learning.

III. METHODOLOGY

The development process of the e-book in this study is shown in Fig. 2 [20]. The study starts with the background analysis in which literature review and a survey of related materials on the market were conducted. The study aims at designing an e-book for learning pharmacological English vocabulary with different types of multimedia components, such as text, audios, and images. Details concerning the development procedures after the background analysis are described in the following sections.

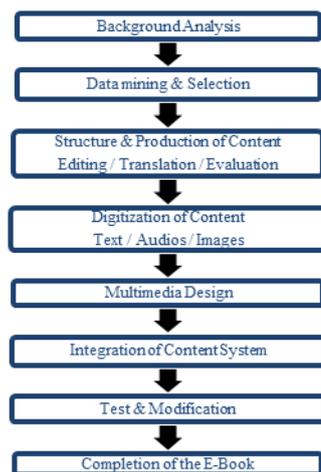


Figure 2. Steps used to develop the e-book [20].

A. Word Selection

The e-book in this study teaches approximately 50 pharmacological English vocabulary frequently used in psychiatry. The importance of pharmacology in psychiatry is manifested because medication is one of the main therapies in the treatment of psychiatric patients [21-22]. Meanwhile, the role of nurses is stressed in the management of psychotropic medications [23]. Psychiatric nurses' responsibilities include participating in medication decision making

with medical teams, providing patients with medication knowledge, monitoring patients' symptoms, and assessing medication effectiveness [21]. In addition, some nurses claimed professionals' pharmacological knowledge might influence patients' trust in the medication and would be central to the quality of care for psychiatric patients in hospitals [24]. Thus, pharmacological vocabulary in psychiatry is selected as the topic of the e-book in the present study.

B. E-book Structure

The content of the e-book is divided into 6 sections according to two reference books about psychiatric drugs [22, 25]: sedative-hypnotics, mood stabilizers, antipsychotics, anxiolytics, antidepressants, and treatments for extrapyramidal symptoms (EPS). Each section includes specific drugs used in treatments of different kinds of psychiatric diseases or symptoms and, meanwhile, provides an online test system. There are 4 learning units for each drug: (1) a drug name in written forms, (2) explanations of the effects and side effects of the drug, (3) an audio pronunciation of the drug name, and (4) the picture of the drug. The structure of the e-book content is explained below [21-22], as shown in Fig. 3:

- 1) *Sedative-hypnotics*: Five drugs used to induce sleep are recorded in the e-book
- 2) *Mood stabilizers*: Five drugs used to treat mood disorders are given in the e-book.
- 3) *Antipsychotics*: Ten drugs used to treat different kinds of psychosis are demonstrated in the e-book.
- 4) *Anxiolytics*: Nine drugs used to prevent anxiety are shown in the e-book.
- 5) *Antidepressants*: Fifteen drugs mainly used to treat major depression are presented in the e-book.
- 6) *Treatments for EPS*: Night drugs used to alleviate EPS are collected in the e-book.

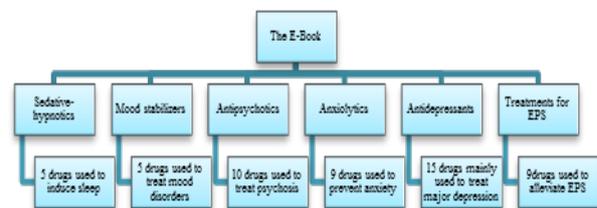


Figure 3. The structure of the e-book content.

C. Multimedia Production

Text, audios, and graphics were integrated in the e-book of pharmacological English vocabulary. The source of the words and pictures was authorized from the drug identification system established by the Department of Pharmacy in Kaohsiung Medical University Chung-Ho Memorial Hospital. The English audio of the drugs was produced by some software such as Natural Voice Reader and Audacity. Finally, the combination of all the multimedia components was

made through the package software tailored to produce e-books, called Zmaker.

D. E-book Evaluation

The e-book was tried by 17 participants, including 11 nurses and 6 nursing students or graduates. Afterwards, a 5-point Likert-style questionnaire of agreement with 10 items was used to elicit participants' opinions on the importance and practicability of the e-book content in learning pharmacological vocabulary. Each item had five choices, including Strongly Agree (5), Agree (4), No Comment (3), Disagree (2), and Strongly Disagree (1). The items target the following elements: Question 1 concerns participants' perception of the importance of learning pharmacological English vocabulary. Question 2 concerns the practicability of the e-book. Questions 3 to 4 concern participants' attitudes toward the e-book. Questions 5 to 8 concern multimedia learning. Question 9 relates to the test system. Question 10 concerns recommendations of the participants.

IV. RESULTS AND DISCUSSION

The cover of the e-book is shown in Fig. 4. After clicking on the lower right button "next page" in Chinese, learners can enter into the main page of the e-book, shown in Fig. 5. Six sections with a bilingual (English and Chinese) button for each are presented in this main page. The content and the operation mode of one section are explained below:

After clicking on the button "Sedative-hypnotics", learners will get access to a list of five drugs used to improve the quality of sleep, shown in Fig. 6. By clicking on one of these five listed drugs, learners can start to learn the pharmacological English vocabulary with multimedia annotations, shown in Fig. 7. The learning of the pharmacological vocabulary was done through a flashcards-based method. The flashcard comprises the pharmacological vocabulary in a written form with various types of annotation, including a picture, an English audio pronunciation, and Chinese information about the main effects and side effects of the drug. Learners can repeatedly practice the pronunciations of the drugs with the written form of the words, which corresponds to Chapelle's CALL principles about varying linguistic input. In addition, all the multimedia annotations are displayed near each other on the page to foster learning effectiveness, as mentioned in Mayer's spatial contiguity principle.

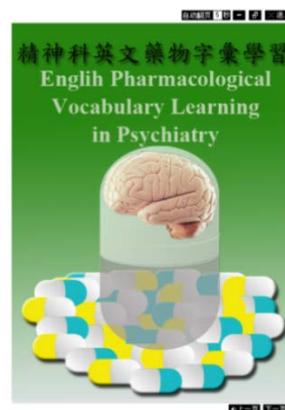


Figure 4. The cover of the e-book.



Figure 5. The main page of the e-book.

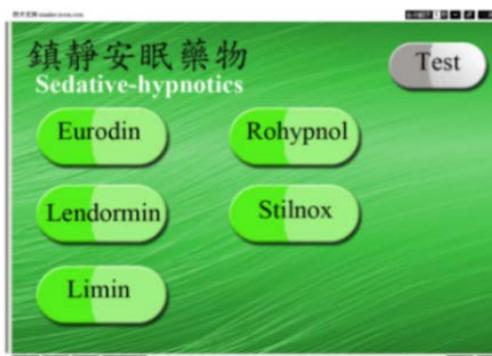


Figure 6. A list of drugs in the section of sedative-hypnotics.



Figure 7. A flashcard used to teach pharmacological vocabulary.

An online test system for learners to understand their learning effectiveness is also included in each section, as shown in Fig. 6. When learners click on the button “Test” on the page, a multiple choice test will be given in a pop-up web page, shown in Fig. 8. The test contains several questions with pictures of the drugs. Each question in the test provides learners with 2 choices about the names of the drugs. Learners should select the right name of the drug corresponding to its picture. The test system is accompanied with a self-checking function to immediately give learners feedbacks, shown in Fig. 9. After learners click on the choice for each question in the test, they will quickly receive an icon of a smile face for a correct answer and an icon of a cross for a wrong answer. This design consists with Chapelle’s CALL principles concerning correcting errors.

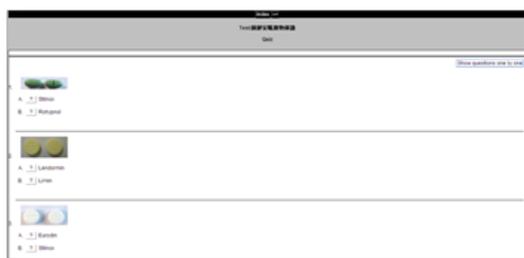


Figure 8. The online test system.



Figure 9. The self-checking function provided by the test system.

The questionnaire results of participants’ opinions on the e-book content are listed in Table 1. As the small samples were involved in this study, descriptive statistics were used to analyze the collected data. All responses to the questions in the questionnaire were averaged and the standard deviation was analyzed. The Cronbach’s α value for the questionnaire was 0.903, higher than 0.7, indicating that the questionnaire was reliable. Several findings are obtained:

1. The overall average score was 4.37, indicating that the majority of the participants were agreeable to the benefits brought by the e-book.
2. Q1 had the highest score (4.71), which meant that pharmacological English vocabulary would be a potential teaching content. This result partly corresponded to the previous finding about the

importance of specialized vocabulary in the field of nursing.

3. Q9 had a higher score (4.59), suggesting that the test system was useful for learning pharmacological vocabulary. This result consisted with Chapelle’s CALL principles concerning the corrections of learners’ linguistic output.
4. A higher score for Q10 (4.47) meant that the learners would intend to recommend the e-book to their classmates or colleagues.
5. The scores for multimedia annotations, including Q6 and Q8, are also high (4.41), indicating that pictures and English audio pronunciations provided better vocabulary learning experience. This result resembled previous research concerning the positive effects of pictorial and audio annotations on vocabulary acquisition.

TABLE1. THE QUESTIONNAIRE RESULTS

Questions	Average score (STD)
Q1. I think learning pharmacological English vocabulary is important.	4.71 (0.588)
Q2. This e-book helps me learn pharmacological English vocabulary.	4.35 (0.606)
Q3. I enjoy studying pharmacological English vocabulary with this e-book.	4.18 (0.728)
Q4. I enjoy studying pronunciations of the pharmacological English vocabulary with this e-book.	4.29 (0.470)
Q5. The Chinese explanations in this e-book help me understand the drugs.	4.06 (0.966)
Q6. The pictures of the drugs in this e-book facilitate understanding the drugs.	4.41 (0.507)
Q7. English pronunciations of the pharmacological vocabulary help me learn pharmacological English vocabulary.	4.24 (0.831)
Q8. English pronunciations of the pharmacological vocabulary help me learn how to pronounce the vocabulary.	4.41 (0.618)
Q9. The test system of the e-book helps me learn pharmacological vocabulary.	4.59 (0.507)
Q10. I would recommend this e-book to other students or colleagues.	4.47 (0.717)
The overall average score	4.37

In the future, a quasi-experiment will be conducted while students’ self-studying with e-book (1) to determine whether or not learners’ content knowledge and English language will be improved; (2) to understand students’ satisfaction and perceptions. In addition, a control group using a teacher-centered face-to-face style of instruction will be conducted in order to investigate whether or not there is a significant difference in students’ performance of learning pharmacological English vocabulary between

the two groups with and without e-book implementation.

V. CONCLUSION

The study is to develop an e-book for nursing students or nurses to effectively learn pharmacological English vocabulary. The features of the e-book are described below:

1. The e-book mainly combines three multimedia components, including text, graphics, and audios. Such a combination creates an effective environment for learning pharmacological English vocabulary.
2. The on-line evaluation system included in the e-book can investigate the learning effectiveness of the learners.
3. A self-checking function is also provided by the on-line evaluation system. Learners can receive immediate feedback about the answers to the questions to check their learning progress.

After the e-book was tried by 17 participants, their positive responses indicated that most learners were satisfied with the e-book.

ACKNOWLEDGEMENTS

This work was partially supported by the National Science Council (NSC), Taiwan, ROC, under Grant MOST 103-2410-H-151-008. In addition, the authors would like to thank the Department of Pharmacy in Kaohsiung Medical University Chung-Ho Memorial Hospital for authorizing the authors to utilize the information in the drug identification system it established.

REFERENCES

- [1] Müller, A., "Addressing the English language needs of international nursing students," *Journal of Academic Language & Learning*, vol. 5., pp.14-22, 2011.
- [2] Yang, M.-N., "Nursing pre-professionals' medical terminology learning strategies," *Asian EFL Journal*, vol. 7., pp.1-18, 2005.
- [3] Wolf, Z. R., "Learning the professional jargon of nursing during change of shift report," *Holistic Nursing Practice*, vol.4., pp.78-83, 1989.
- [4] Deans, C., "Medication errors and professional practice of registered nurses," *Collegian*, vol. 12., pp.29-33, 2005.
- [5] Abidin, M. J. Z., Pour-Mohammadi, M., Shoar, N. S., Cheong, S. T. H., and Jafre, A. M., "A comparative study of using multimedia annotation and printed textual glossary in learning vocabulary," *International Journal of Learning & Development*, vol. 1., pp.82-90, 2011.
- [6] Kim, D. and Gilman, D. A., "Effects of text, audio, and graphic aids in multimedia instruction for vocabulary learning," *Educational Technology & Society*, vol. 11., pp.114-126, 2008.
- [7] Yeh, Y. and Wang, C.-w., "Effects of multimedia vocabulary annotations and learning styles on vocabulary learning," *CALICO Journal*, vol. 21., pp.131-144, 2003.
- [8] Rimrott, A., "Computer-assisted vocabulary learning: multimedia annotations, word concreteness, and individualized instruction," Doctoral dissertation, Simon Fraser University, Burnaby, BC, Canada, 2010.
- [9] Dudley-Evans, T. and John, M. J. S., *Developments in English for Specific Purposes: A Multi-Disciplinary Approach*. Cambridge, England: Cambridge University Press, 1998.
- [10] Harding, K., *English for Specific Purposes (Resource Books for Teachers)*. Oxford, England: Oxford University Press, 2007.
- [11] Belcher, D., *English for Specific Purposes in Theory and Practice*. Ann Arbor, MI: University of Michigan Press, 2009.
- [12] YU, W.-C. W., "Nursing professionals' evaluation in integrating the computers in English for nursing purposes (ENP) instruction and learning," *The Turkish Online Journal of Educational Technology*, vol.12., pp.124-139, 2013.
- [13] Levy, M., *CALL: Context and conceptualisation*. Oxford, England: Oxford University Press, 1997.
- [14] Lee, K.-w., "English teachers' barriers to the use of computer assisted language learning," *The Internet TESL Journal*, vol. 6., 2000.
- [15] Chappelle, C. A., "Multimedia CALL: lessons to be learned from research on instructed SLA," *Language Learning & Technology*, vol.2., pp.22-34, 1998.
- [16] Mayer, R. E., *Multimedia Learning*. Cambridge, England: Cambridge University Press, 2001.
- [17] Lee., T.-R. S., *Multimedia assisted language teaching :theory & application*. Taipei, Taiwan: Jin-Wen Institute of Technology, 2005.
- [18] Chappelle, C. A. and Jamieson, J., *Tips for Teaching with CALL: Practical Approaches to Computer-assisted Language Learning*. New Jersey: Pearson Education, 2008.
- [19] Rusanganwa, J., "Multimedia as a means to enhance teaching technical vocabulary to physics undergraduates in Rwanda," *English for Specific Purposes*, vol. 32., pp.36-44, 2013.
- [20] Tsai, S.C., "Courseware development for semiconductor technology and its application into instruction." *Computers & Education*, vol. 52., pp.834-847, 2009.
- [21] Damon, L., Matthew, J., and Sheehan, J., *Inpatient Psychiatric Nursing: Clinical Strategies & Practical Interventions*. New York, NY: Springer Publishing Company, 2012.
- [22] Labbate, L. A. and Rosenbaum, J. F., *Handbook of Psychiatric Drug Therapy*. Philadelphia, PA: Wolters Kluwer Health/Lippincott Williams & Wilkins, 2010.
- [23] Duxbury J. A. and Baker J., "The use and nursing management of benzodiazepines in acute, mental health inpatient care: a discussion," *Journal of Psychiatric and Mental Health Nursing*, vol. 11., pp.662-667, 2004.
- [24] Kemppainen JK1, Buffum M, Wike G, Kestner M, Zappe C, Hopkins R,...Bartlebaugh P., "Psychiatric nursing & medication adherence," *Journal of Psychosocial Nursing & Mental Health Services*, vol. 2., pp.38-49, 2003.
- [25] Yang, Shu-Yu, *Practical Guide to Psychotherapeutic Drugs for Family and Consumer*. Taipei, Taiwan: The Taiwan Alliance for the Mentally Ill, 2004.