

# The Design of Computer Multimedia Material for English Language Learning

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**Abstract:** This paper addresses the design of multimedia presentation of language learning material for Freshman English writing course at a University in Taiwan. The material is used to assist teacher's instruction, and serves as the preliminary step regarding the implementation of instructional strategies in the language teaching course for digital learning materials. Feedbacks from students are collected to reflect learners' preferences over the current status of multimedia learning. The purpose of this paper is to demonstrate an initial step in achieving the effective learning by coordinating external and internal stimulus to the learners' cognitive activities.

## 1 Introduction

The advance of Information Technology (IT) has varied the ways of learning in recent years. One important application of information technology is distance learning, which has become a prevalent way of learning. Research has focused on the comparison of learning performance between traditional learning and digital learning. However, due to the cost-effectiveness of digital learning and the widely spread of the Internet, it is foreseen that digital learning will become one of the important method in the future learning activities. In general, the applications of IT in the field of digital learning can be classified into learning material development and learning management system. The study focuses on the material development related to the instructional and learning theory, and it serves as the preliminary discussion related in achieving the effective learning through well-designed digital learning material.

As the development of IT, many areas of English learning have employed computers as learning tools. In the area of English writing, the most common use of the computer technology is mediating communication such as E-mail, chat, or MUDS and MOOS (Sokolik, 2001). By employing the notions of negotiation of meaning from second language acquisition, the goal of students' writing is having students engage in real communication through the Internet. Some researchers found that the computer is a helpful tool; nevertheless, there are still some other aspects that computers can provide to facilitate students' writing. The area of how to use the computer to help learners develop and elaborate their specified cognitive representation for their second language writing is still under explored. Not knowing how to start writing and what to write are always two major challenges novice writers face. The use of information technology can help English writing teachers to produce multimedia materials to facilitate their students in their writing processes. The study is intended to use the computer as a tool to integrate teaching materials through the use of multimedia to motivate students by presenting second language writing in its more complete communicative context. In addition, with regard of schema theory, the use of media can help students relate their existing schemata and employ their prior background knowledge in their writing process.

In the study, theories related the above goal are discussed in the following section of literature review. It consists of three parts: the first one is the fundamental instruction and learning theories, and language learning theory. The second one is the design of multiple external representations in facilitating instruction and existing theories in achieving effective learning. The third one is previous study done by the author related to the effects of various ITs upon the development of learning materials and learners' learning activities. In light of these reviews, this study focuses on the implementation of instructional strategies in the development of digital learning materials, and the first step is the integration of classroom curriculum into digitalize and programmed computer material. The preliminary design philosophies and related program in the implementation are presented and discussed in the section of material design. Then, the designed material was used in a semester course, and students' feedbacks were collected to reflect current status of digital learning material upon college student's learning, followed by the conclusion as the end of this paper.

## 2 Literature Review

### 2.1 Language learning and Instruction

The theory regarding how people learn the foreign language primarily base on two assumptions. The first one focuses on the cognitive science, and discusses the mental process of learners with their internal representations and their structures related to the external language stimuli. The second one originated from the cultural psychology, which treated the learning process as a social and cultural process. Frawley (1997) proposes non-conscious, conscious, and meta-conscious processing. The first two processes recognize the learning process as a cognitive activity, and the third one fulfills the role of human learning as an internal mental process and external social-cultural interaction. Zahner et al (2000) described the language learning is a deliberate and controlled activity, not only involves the non-conscious and conscious processes but also situated it the meta-conscious stage. It invokes learners' inter-mental process socially and culturally.

The trend of teaching English writing has changed from product-oriented to process oriented. Unlike the traditional paradigm, which focuses on evaluating students' writing, the process approach emphasizes on the writer's whole writing process (Kroll, 2001). From a process perspective, the composing process is a recursive, exploratory and generative one (Silva & Matsuda, 2002). The procedure includes stages of generating ideas, structuring, drafting, reviewing, evaluation, and focusing (White & Arndt, 1991). Therefore, incorporating writing strategies is an important issue in the classroom of process approach. However, the process writing approach is time consuming (Harmer, 2001).

### 2.2 Multiple External Representations

Ainsworth, Bibby and wood (1997) made a study with performance of estimation task, the learning process is carried out by two different cases. The first one learning material has two External Representation carrying the same information for children to learn, and the second one simultaneously display two dimensions of information. For example, a mathematic variables relationship is to be stated in both equation and picture.

Anisworth's Multiple External Representation has the functions of complement, constrain, and construct. The complementary information is needed when a single representation is not sufficient to present all the information needed. The algebra relationship between mathematic variables is an example. The relationship can be presented as mathematic equation in text format or graphic image. For a problem solving study, Tabachneck et al found that, in an algebra problem, each representation was associated different strategies. Multiple representations stimulate learners to exercise multiple strategies. The weakness of each strategy is overcome by switching the strategies during the problem solving process.

Moreover, the function of constrain is achieved by using one representation to constrain the interpretation of a second representation. By doing so, the learner can develop a better understanding of a domain. One of the examples is using the inherent properties of a presentation to constrain the ambiguity of another one. Stenning and Oberlander (1995) presented a study regarding that the graphical representation in general is more specific than the narrative one in describing the relative position of two objects. Hence, the narrative representation can be constrained by the second graphical one.

The third function is construction of deep understanding and thinking. Usually, for an abstract idea or notion, it is very difficult for learner to build his internal metal entity (or representation) for further construction of concepts or procedure knowledge. Dienes (1973) proposed that same concept expressed in varying way can help learner building such mental entities by providing perceptual variability.

Since this study is to implement the instructional strategies with multiple representations in the multimedia material to activate the deep thinking in the learners, the studies of multiple representations are needed to be included. One of the major functions in multiple representations is the construction of thinking, and it can be achieved by the abstraction and extension of the relations between representations in learner's internal metal exercise or instructor's direct teaching (Ainsworth, 1999). The challenge then will be the role of multiple presentations during the learner's conceptual construction process. Too many external representations will make the learner passive in forming his own mental presentation and hurdle his further construction of existing concept with new one. However, too few representations may not make learner form the corresponding entity or a wrong entity. Contingency theory (Wood & Wood) suggests that the support of presentation should be based on the learner's feedback and performance during the learning activities. Scaffolding strategy proposes correspondingly that the level of support should fade out gradually when the learner can achieve a cognitive linking of representation. The representation can be removed when the learner can construct his own internal representation without much external stimulus.

### ***2.3 Effect of Information Technologies***

The advance of computer network and related information technology makes the Web-based learning as a new learning style. This new type of learning model is pushing educational scholars to redefine the field of instructional material design and related theories of learning, especially regarding the mode of presenting material as well as the interaction between learners and materials. Among the above issues, the varieties of presentation modes are increased by the advance of related information technologies. The presentation modes in the study include classroom instructor-lead mode, streaming video mode, and programmed mode.

The challenge of integrating curriculum and implementing instructional strategies into computer multimedia material primary is the gap between the instructor and the program expert regarding the knowledge to teach and technical limitation of authoring tool. The author of this study (Ting, 2004) proposed a model addressing the relationship model among instructor, programmer, and learning content to reflect this challenge, and also use a practical case to examine the effects of various information techniques applied in the authoring process, with the interview results and participating in the material development process, Ting presented several phenomena observed. For instance, the instructor mentioned that he removed "situation-based" lecture used in the classroom when he was filmed for the streaming video mode materials. The "situation-based" lecture was a reinforcement of his teaching based on the learners' responses during the lecture. Since there were no responses in the filming process, he got no clues or intentions to give these situation-based talking, especially giving example(s) for some proposition(s). Therefore, the learners of streaming video mode might not get the chance to learn various examples of propositions if they needed them. The deletion of the knowledge content when the instructor cooperated with the programmer in developing programmed mode materials, for example Authorware. Since the content needed to be transferred and interpreted by the programmer, if a concept was difficult for the programmer to present with the programming tool, it might be removed due to the constraint of resources.

As to the learners' feedback to the digital learning material, Ting (2003) found that significant differences are found due to the different modes of presenting materials. Participants from three different backgrounds (university students, vocational school students, and enterprise employees) are invited to participate in the study. The significant differences of learners' satisfaction toward three learning modes are learning style (presentation mode) and time arrangement. In the survey of learning style, classroom instructor-leading mode has the best satisfaction, followed by programmed mode, then streaming video. According to the follow-up interviews with some participants, their responses were that they had been used to the traditional classroom learning mode, and had direct eye contact with the teacher even there were no Q/As between them. The participants in the other two E-learning modes responded that they were unfamiliar with the learning situation in which the instructor did not show up. It infers that digital learning has not been popular among these participants. The second highest satisfaction of learning mode was the programmed one, and the reason was the good interaction between the material and learners.

### ***2.4 Summary***

The primary components in designing the digital learning applications are: learner motivation, learner interface, content structure and sequencing, navigation and interactivity (Allen, 2003). The goal of digital learning material for sure is to assist learner to achieve best learning performance through effective instructional strategies implemented in the learning material. Several related theories have been revealed in the above section, and their concern is to design a best learning environment. Such environment not only creates the external stimulus in activating learner motivation into the engagement of learning, but also strengthens the internal cognitive processes in forming learner's propositions and procedure knowledge.

This study will base on the above notions to implement related theories into a language learning course, "Freshman English Writing". Due to the constraint of available resource, this paper will present a preliminary result in integrating the multimedia materials which are used separately during the instruction activities.

## **3 Material Design and Development**

Before this study, the writing materials used to assist the teacher's instruction are textbook and graphics in the hard-copy format, and video and audio tapes played by video/audio player. In this study, all of the above materials are digitalized through appropriated equipments and transformed into appropriate formats for the storage and later manipulation by the computer authoring program. The integration and sequencing of learning material is programmed through the Authoring tool: Macromedia Authorware. Authorware is chosen due to its

strength in variables setup and logic controls in fulfilling the needs of multiple flow paths for supporting adaptive learning, and such characteristics are contrast to those in Flash or Director, which is good at rich multimedia presentation and graphic motion control.

Functions of learners' interaction with material includes the content browsing and quiz taking, and they are made through some information technologies to make the material more attractive to students. The program is described logically to demonstrate how the fundamental sequencing mechanism is implemented. Type of responses available in Authorware 6.0 are Button, Hot Spot, Hot Object, Target Area, Pull-down Menu, Conditional, Text Entry, Key-press, Tries Limit, Time Limit, and Event. Integrating the above user responses with predefined control logic, the implemented material can provide fundamental passively adaptive learning for individual learner. One of the goals in future study is to include the learner profile into the sequencing and navigation of learning activities actively and dynamically.

In this study, the material was designed for "Freshman English Writing" course for English-major students at a university in northern Taiwan. Because this project was carried out in the second semester of an academic year, the researchers used the already-used textbook, *Developing Composition Skills* by Mary K. Ruetten, as a major source of material development in order not to confuse students' learning. The content of three chapters, which represent three writing genres, digitalized as computer assisted language learning materials. Every genre includes phases of prewriting activities, readings, writing step explanations, language usage, and writing assignments. In addition to the revised textbook contents, some extra writing tasks were also inserted. The goal of these writing tasks is to provide learners more authentic materials as well as more authentic contexts to write. For the purpose of illustration, some examples of the chapter related to analyze a process are illustrated below.

Because the reading in this chapter is about how to do a library searching operation on a computer, the prewriting activities the researcher designed are asking students to do some library searches at their school library and list the procedure step by step. The purpose of these activities is to help students relate to their schemata for their future writing. The activities are shown in Figure 1 and Figure 2.

	Title	Author	Publication/Year	Call Number
A	1.	1. Kuhlmann		
	2.	2. Arnold de Bontrop		
	3.	3. Amy Yao		
	4.	4. [?]		
	5.	5. [?]		
B	1. Materials Science 101			
	2. [?]			
	3. [?]			
	4. [?]			
C Topic: Controlling on the Internet	1.			
	2.			
	3.			
	4.			
	5.			
D	1.			1. [?]
	2.			2. [?]
	3.			3. [?]
	4.			4. [?]
	5.			5. [?]

Figure 1. Presented learning activities for CALL

**Prewriting**

**Activity 2:** As a matter of fact, while you were trying to find the missing information, you were required to take a series of steps to use the on-line service. That is, you were performing a process. Listing is a way first to get and then to develop ideas in this type of writing. In the following practice, you need to recall what steps you have taken to find the information and write a list of the steps.

**Homework:**

- (1) How do you locate the book by the title?
- (2) How do you locate some books by the author?
- (3) How do you locate the book by the call number?
- (4) How do you locate related books under a topic?
- (5) How do you locate the article by given information?

Buttons: Back, Home, Next

Figure 2. Presented learning activities for CALL

In order to motivate students' learning, the model essay for students to analyze the writing styles, the content of one of the essays are divided into different sections for students' comprehension check. In addition, the sentence order of the other model essay was scrambled for students to find the right process of the action. Furthermore, students can choose to listen to the texts being read by recorded voice.

With regard to writing assignment, the researchers designed a series of activities as prelude to the process analyzing writing. This was done due to the fact that students always complained about not knowing what to write. These activities offered students some vocabulary words and ideas for their writing assignment. In this case, they needed to write some procedures of traditional Chinese or Taiwanese wedding. One of the activities was done as an information gap activity. Students read some gapped texts related to the traditional western wedding and listen to the recorded voice to read the complete version of the text. Then they have to fill in the gaps by selecting words from the word bank offered on the computer screen. In this way, they may learn some vocabulary words related to wedding (see Figure 3). The text was adopted from the Cultural dictionary, and has been revised. They also can try to find some websites to provide them information about Chinese or Taiwanese wedding traditions (Figure 4). Moreover, they could click the viewing buttons to view some video clips of a Taiwanese wedding (Figure 5). When the student learned several marriage related vocabulary and customs, they were required to write the essay. The material here is intended to promote students' interest in the wedding procedure, and motivate their intentions in using rich and various terminologies in their writing.



Figure 3. Portal for supplementary CALL material - “wedding”



Figure 4. The narration of multimedia learning material

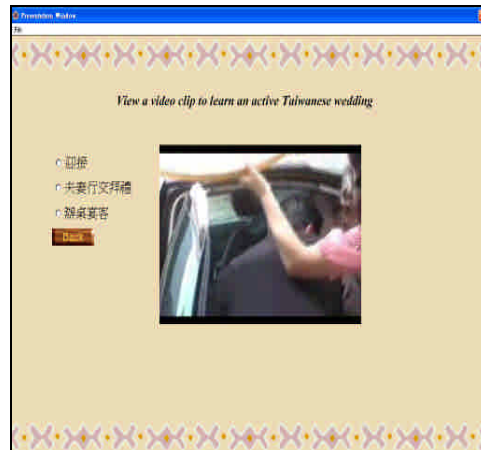


Figure 5. The video clips of CALL material

As shown in the Figure 5, the buttons are made with the Authorware program to support the function of sequencing program.

## 4 Preliminary Survey Result

### *Subjects*

Two classes with 24 and 25 freshman students majoring in English were presented with the experimental material. The learning content is Freshman English Writing course presented in the multimedia form described in the previous section. Due to the limitation of time and available computers, all learners are seated as in the computer lab with computer projector during the learning activity. The instructor (author of this study) used a computer connected to the projector to present the CALL material. All learners were encouraged to ask questions as a normal classroom course, and they also had their own textbooks for reference.

### *Instrument*

Learners' feedbacks toward the designed learning material were surveyed by a Likert questionnaire as shown in Appendix 1. The topic is divided into four categories: attractiveness of presentation mode, helpfulness of presentation media, personal preference toward presentation style, and overall acceptance. There are five questions for each category, and each question has 5-point scale. The total questions are 20.

### *Survey Results*

The preliminary summary result of learners' feedbacks upon the designed CALL material is shown in the Figure 6, and it is obvious that the attractiveness of multimedia presentation gains the best positive feedback from the students. As to the helpfulness in assisting learning and the style of learning method play fair around the average role in the overall gauge of learning activities for language learning. The results may be expected to be further improved by the inclusion of adaptive interaction between learner and material.

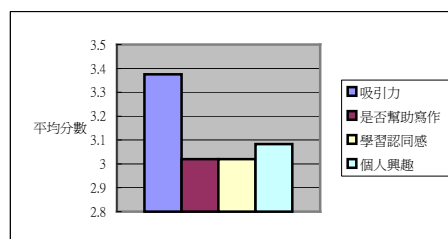


Figure 6. Summary result of learners' feedback upon the designed CALL material

## 5 Conclusions

The role of computer has changed from the facilitator of learning into activate learners into deep thinking. However, misunderstanding regarding the attractiveness of learning material and interactivity of learner with material is the richness of display and plenty of menu buttons in the user interface. As a matter of fact, the effectiveness of learning is best achieved through the construction of learner's internal reflection and thinking due to the external multimedia stimulus, which should be able to activate learners into the engagement of deep thinking and constructing their own mental entities and corresponding representations and concepts. This paper reveals some fundamental theories related to the up-to-date instruction and learning theory, especially those related to the Computer Assisted Language Learning. In addition to the challenge faced by computer multimedia material designers, how the learning material should play as an effective one is clarified from the perspective of multiple external representations. Followed with studies related with the effect of various ITs upon the development of learning material, learners' feedback upon different technologies are also briefed.

Along with the above literature review, this paper addressed the design of multimedia presentation of language learning material for an English Writing course offered at an University in Taiwan. The material was used to assist teacher's instruction, and serve as the preliminary step regarding the implementation of instructional strategies in the language learning course for digital learning materials. Feedback from students were collected to reflect learners' preferences over the current status of multimedia learning

Further study will concentrate on three issues in sequences. The first one is the integration of Authorwaring program with the instructional strategies. The next step will be the incorporation of dynamic learner profile into the navigation and sequencing of learning material. The third step is to examine the effect of the above function's performance from the perspective of social and cultural interaction between learners and learning material. It is expected to achieve the effective learning by coordinating external and internal stimulus to the learners' cognitive activities through well-designed digital learning material.

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## Appendix

	題 目	非常同意	同 意	普 通	不 同 意	非常不同意
1	本課程所使用電腦教學工具來呈現教材的教學方式，是吸引我的	5	4	3	2	1
2	本課程的電腦教學教材能引起我的興趣	5	4	3	2	1
3	我不會對本課程的電腦教學教材的內容感到枯燥乏味	5	4	3	2	1
4	我的注意力會被電腦教學教材所吸引	5	4	3	2	1
5	本課程的電腦教學教材是生動有趣的	5	4	3	2	1
6	本課程的電腦教學教材，更能協助我寫出好的文章	5	4	3	2	1
7	使用電腦呈現多媒體教材的學習方式，有效的增進我的英文寫作能力	5	4	3	2	1
8	本課程的電腦教材內容，使我更進一步瞭解寫作技巧	5	4	3	2	1
9	課堂所使用的電腦多媒體，更能激發我思考英文寫作的相關知識	5	4	3	2	1
10	英文寫作能力的培養，能透過本課程的電腦教材，提供有效的訓練內容	5	4	3	2	1
11	使用電腦多媒體教材的學習方式，對英文寫作是適當的	5	4	3	2	1
12	我能接受以電腦多媒體教材的學習方式，來學習英文寫作	5	4	3	2	1
13	對學習英文寫作而言，以電腦多媒體來呈現教材的學習方式是適當的	5	4	3	2	1
14	電腦多媒體教材的學習方式，應該用來替代傳統教學方式	5	4	3	2	1
15	對未來英文寫作或相關課程，希望能以電腦多媒體方式呈現教材內容	5	4	3	2	1
16	整體而言，我喜歡電腦多媒體教材的學習方式	5	4	3	2	1
17	電腦多媒體教學方式，無法增進我對英文寫作的滿意情形	5	4	3	2	1
18	對本課程的電腦教學內容，滿足我對英文寫作練習的期望	5	4	3	2	1
19	我無法接受英文寫作課程，以電腦多媒體教學方式進行	5	4	3	2	1
20	我對本課程的電腦教學感到滿意	5	4	3	2	1