International Journal of the Physical Sciences Vol. 7(1), pp. 107 - 115, 2 January, 2012
Available online at http://www.academicjournals.org/IJPS
DOI: 10.5897/IJPS11.1605
ISSN 1992-1950 ©2012 Academic Journals

Full Length Research Paper

Integrating anchored instructional strategy and modularity concept into Interactive multimedia PowerPoint presentation

Yuh-Tyng Chen

Department of Information Management, Tainan University of Technology, Yung-Kang, Tainan 710, Taiwan.
E-mail: i5438888@pchome.com.tw. Tel: 886-6-253-2106 ext. 5035. Fax: 886-6-254-0702.

Accepted 12 December, 2011

This study is based on the cognitive theory of multimedia learning to propose an alternative presentation integrating anchored strategy and modularity concept into a Microsoft PowerPoint presentation for classroom learning. With the anchored instructional strategy and rich visual interactivity, the presentation helps students to acquire more information and remember more ideas. In addition, incorporated hyperlinks and modular design strategies, teachers can easily select the particular slide they need to help student with their questions, thereby reducing their information load. This method can support students' cognitive process with the comprehension of the content being taught so as to enhance their learning attitude and performance. In this study, an exploratory test was conducted with 83 students in a university of technology. The results indicated that the students in the experimental group had a better learning effectiveness for lectures with interactive PowerPoint presentation than that of the control group.

Key words: Cognitive theory of multimedia learning, anchored instructional strategy, modularity concept, hyperlink, interactive PowerPoint presentation.

INTRODUCTION

Today, the multimedia-based instruction is being widely applied in the blended learning environment to improve learning (Liao, 2007; Mayer, 2001). The multimedia representation includes text, audio, graphs, photographs, animation or video. Using the multimedia content in classroom is readily and effectively communicated between teachers and learners (Bartsch and Cobern, 2003; Russell, 1998). Recently, many teachers have started using technological tools to create teaching materials in multimedia formats. It is helpful to effectively scaffold learners (Lai et al., 2009; Lightfoot, 2005). However, due to the limitation of cost and computer literacy, PowerPoint after all is a primary enabler of rapid e-learning content development for instructional designer. Many college instructors accompany their lectures with PowerPoint presentations so that their lectures will have a positive effect on their students' attitude and belief of self-efficacy (Rankin and Hoaas, 2001; Susskind, 2008). And students also have positive attitude that the lectures were more organized, clear, and interesting. Various formats such as texts, tables, pictures, graphs, sounds, visual data, video clips and so on were able to be placed into PowerPoint slides (Gupta, 2010). With the computer-based environment, teachers can present integrated multimedia instructions, including media format selection, and have random access to multimedia instruction (Corbeil, 2007). Researchers found that lecturing using PowerPoint presentations can enhance the lecturer's ability to order and pace his/her lecture and present a clear summary (Lowry, 1999). This is because lecturers can easily control the lecture content and display the sequences when using PowerPoint slides. However, PowerPoint presentations still have some potential limits. The traditional PowerPoint presentation is known as a "slide show" (Matheson et al., 2002) which includes a series of screens presented one after another just as slides in an old-fashioned slide projector (Beyer, 2011). It is known that the traditional way of teaching discourages active learning, and the slide show presentation simply enlarges the passive nature of the instruction. Lecturing using PowerPoint results in a weak analysis of the learning content (Gabriel, 2008; Zhang et al., 2004). One solution to overcome the above problems is to break away from its static and linear presentation. The interactive PowerPoint presentation style is noticeably attractive and dynamic in interacting with the audience through the visual interactivity because it gives the presenter complete flexibilities to navigate to any desired PowerPoint slides and create the "WOW" factors throughout the entire presentation (Lane and Kosslyn, 2011). However, from the viewpoint of learning, it is easy to capture the learners' attention but to maintain their attention and stimulate their interests and thereby motivate their movement is a hard task.

Generally, an effectively presenting material not only embeds the effective presenting technology but also has a well-designed material content. Schramm (1977) suggested that learning is influenced more by the content and instructional strategy in the learning materials than by the type of technology used to deliver instruction. But few studies examined this association in interactive PowerPoint presentation. The purpose of this study is based on the cognitive theory of multimedia learning to integrate the instruction strategy and modularity concept to design an interactive presentation material and examine whether the interactive PowerPoint is helpful for learning.

LITERATURE REVIEW

Cognitive theory of multimedia learning

Previous reviews showed the way multimedia can improve students' learning effects (Mayer and Anderson, 1991; Muthukumar, 2005). The multimedia learning is learning from verbal and visual information (Mayer and Moreno, 2003). The verbal information included the written form of printed words and the oral form of spoken language, and any represented by pictorial forms such as illustration, diagram, photo, animation, and film are categorized in the visual information. According to the dual coding theory, brain encodes visual and verbal information simultaneously but differently, in separate areas (Lane and Wright, 2009). The brain clearly handles visual content differently than it does in textual information. Text, a coding system, has meaning only in a symbolic sense and viewers must expend a great deal of cognitive resources decoding words and phrases on slides. Under this kind of situation, they have little capacity left to pay attention to the speaker or they pay attention to the speaker and ignore text-heavy slides altogether. Both situations are unfavorable ideal. In contrast, visual processing can occur simultaneously and efficiently along with verbal processing because different brain regions are involved. Including meaningful (content) pictures, video clips and other forms of rich media on slides provides the best learning environment for learners. Besides, images are able to explain, simplify or expand concepts in ways that are very difficult to do with text or even with spoken words. Using picture-based visual communication is able to improve learners' learning and recalling (Levie and Lentz, 1982). Therefore, pictures and graphics, especially, are powerful communication tools if used correctly.

However, when the learning process occurs in the working memory, a cognitive load which is essential for learning will be imposed (Baddeley, 2002; Chandler and Sweller, 1991; Plass et al., 2003). The cognitive load is related to the human information processing capacity. Based on the properties of the task being displayed, there are three categories of the cognitive load: intrinsic, germane and extraneous (Sweller, 1999). The intrinsic cognitive load refers to the burden imposed on the learner to construct a semantic context required for a particular learning task. The germane cognitive load refers to the learning activities that are related to schema acquisition and automation such as asking students to compare solution procedures in structurally similar but contextually different situations (Kalyuga, 2007; Lia et al., 2011). However, the extraneous cognitive load represents the ineffective structure or semantic contents that take over the working memory, thereby reducing the capacity of working memory available for learning activities. The result of poor instructional design will lead to increased extraneous cognitive.

PowerPoint presentation in instruction

Humans can process information coming from auditory stimulus and visual stimulus at the same time (Moreno and Mayer, 2000). Using PowerPoint to present multimedia materials in class can benefit students (Apperson et al., 2008). PowerPoint slides are the grate visual presentation tools which comprise various multimedia formats such as text, chart, graph, sound and video. Teaching with PowerPoint can provide students with a brief description for teaching sequence and organization of the learning contents. This teaching manner benefits the students' further constructing learning concepts and conducting information-processing analysis (Susskind, 2008). However, each slide in the PowerPoint format contains only a small amount of information. PowerPoint presentation is similar to a bullet-style presentation and is only suitable for a low level of information transfer (Tufte, 2003). Teaching with PowerPoint often leads to a weak analysis of the learning content (Gabriel, 2008; Zhang et al., 2004). Particularly, with traditional slide show presentation, the order of the presentation is preset; the presenters have no way to change and select the particular slide they need to help students with their questions. Besides, it is not easy to skip some slides or access a previous view screen without flipping through page after page of the presentation. The presenter may lose chances to make important links between more distantly related topics by showing material in a set order. Recently, interactive PowerPoint presentation has become a trend in business and education. With hyperlink technology and modularity concept, building hierarchically organized structures called presentation network, interactive PowerPoint does not only provides a vivid and profound impact on audience (learners) but also constructs a flexible and reusable designing environment for instructional designer.

Modularity concept in education

Modularity can be described as modules of a complex object to simpler objects. The modules are simplified either by the structure or function of the object and its subparts (Schmidt and Bandar, 1998). A module represents a set of related concerns which include a collection of related components such as features, views or business logic and pieces of infrastructure, such as services for logging or authenticating users. Modules are independent of one another but can communicate with each other in a loosely coupled fashion. Modules can be developed, tested, and/or shared on independent manners. Using modularity concept in lecturing/ or learning can help the instructor and students because modular design offers the following benefits (MSDN, 2009):

1) Provide more expedited course creation for instructors: Creating an online course is often daunting for the instructors. Modular design focuses on the components that go into a single module at a time which simplifies the process, and enable instructors to more thoughtfully design each learning component. Once an instructor has created that first module, then he or she will establish a framework for creating subsequent modules. In addition, by working on one module at a time, instructors can easily integrate the related course syllabus into each modulate.
2) Simplify the course updates: Modular design enables instructors to aim particular parts of the course for amendment without having to overhaul the entire course.
3) Afford the consistency for users: By adding the same types of components to each course module, students can quickly carry on the course's patterns and have a better idea of what to expect than if the course was designed using a varying structure (Kelly, 2009).

Anchored instruction

An "anchor" is often a story, occurrence, or situation that includes a problem or issue to be dealt with that is of interest to the students. All related activities will be designed around an "anchor"; this approach will encourage students become more actively engaged in learning by situating or anchoring instruction around an interesting topic (Bransford and Stein, 1993). Based upon social constructivist theory, anchored Instruction is a paradigm for technology-based instruction. Anchored instruction may also be similar to the problem-based learning. Glaser et al. (1999) showed that technologies useful for delivering anchored modules would include affordances for students to segment and chunk data from the presented "stories" or problems. And Instructional materials should include rich resources so that students can explore as they try to decide how to solve a problem (CTGV, 1993). Anchored instruction is designed to help students learn information so that it can be recalled and flexibly applied to solve problems. Relevant researches suggested that pedagogical approaches such as anchored instruction could enhance students' complex problem solving skills and positive attitudes towards learning (Li et al., 2010; Kumar, 2010; Kellogg, 2010; Baker, 2009; Pellegrino and Brophy, 2008).

METHODOLOGY

The ADDIE model is a basic model for designing and developing learning courses as well as educational content. This model is a systematic instructional design model consisting of five phases: (1) analysis, (2) design, (3) development, (4) implementation, and (5) evaluation. It is suitable for the involvement of smaller sample population and for a general-purpose model. It is often used for production of education products and is chosen for doing the research (Taylor, 2004; Chen et al., 2011). Hence, this study is based on ADDIE model to design and implement an interactive multimedia PowerPoint presentation activity as following steps.

Analysis

This experiment was motivated by the need of 98 students of a university of technology in southern Taiwan to learn Microsoft office skills. This study used an experimental teaching to develop and evaluate the instructional material. The experimental course "Laws and life" is a required general education course for first-year university students. Total workshop duration was 36 h and lectures were spread over 18 weeks at a 2 h rate. Exclude the unusable surveys which were either incomplete tests or questionnaire or not followed instructions were identified and discarded. As a result, 83 respondents (85% of 98 cases) were used as the basis for data analysis. Of these participants, 48% were males and 52% were females. Each subject participated in the study was randomly assigned to experimental group (n=43) and control group (n=40). To understand students' background about the learning content, at the beginning of the semester, the participants were required to take pre-test.

Design

In this study, first, we employed the anchored instruction strategy into the slides to build a learning environment. Second, we cataloged the slides with the concepts of modularity to build the

Figure 1. The linear PowerPoint presentation.

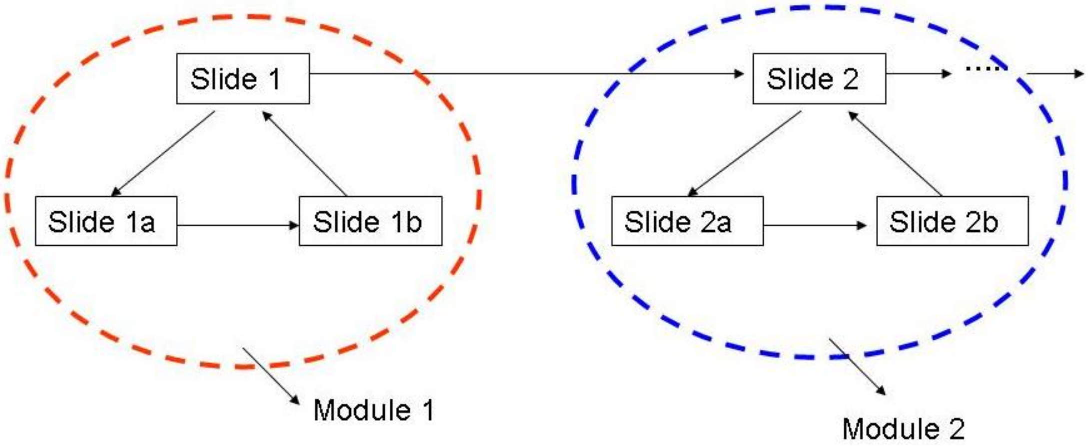

Figure 2. The modularity of interactive PowerPoint presentation.

hierarchically organized structures called presentation networks; each module is an entirely independent slide show. Finally, we borrowed the navigation technology in the presentation networks to provide presenters/learners with the ability to rapidly find and display whatever content they need, whenever they need it.

Development

Step 1: According to the cognitive load theory, the intrinsic cognitive load cannot be changed during leaning, but with appropriate instructional design, it can increase the germane cognitive load and decrease the extraneous cognitive load (Hasler et al., 2007). Therefore, except for the presentation technologies, we also consider the instructional design strategy. We conducted the anchored instruction strategy into the curriculum material because anchored instruction provides a problem-based story environment for students. The goal of anchored instruction is to excite students to develop effective thinking skills and attitudes that lead to effective problem solving and critical thinking (CTGV, 1993).

Step 2: Compared to the conventional linear slide shows, interactive presentation styles do not only address the benefits, but also offer the users with much needed flexibility, ease of use and efficiency in managing the presentation slides as brand marketing resources (Hu, 2011). Accordingly, we adopted the concept of modularity to divide the contents of the entire presentation into individual modules (Figure 1 and 2). Each module is an entirely independent slide show, containing just a few closely interrelated slides. It is easy to modify any slide in the separated module in future. Each module also can supply to individual or others repetition uses. From the information technology management point of view, it is a cost-effective and time-efficient approach.

Step 3: For resolving the extraneous cognitive load, we must assure that something should be as simple as having only one main idea per slide. We used the comic graphics instead of complicated texture or bullet points to illustrate the instructional content (Figure 3).

Step 4: Finally, we conducted web navigation to integrate these separated modules to build a hierarchical presentation network. The navigation (hyperlink) technology gives a teacher the power to interact with students and be far more natural, spontaneous and conversational (Lane and Wright, 2009) (Figure 3).

Implementation

In the study, the experimental group (43 students) was taught with interactive PowerPoint materials; whereas the control group (40 students) was taught via a traditional PowerPoint lecture method where the teacher presented course-related contents to students. By using interactive PowerPoint, the teacher leads the students into a "story" environment with the comic graphics. It can capture students' attention because it is interesting and related with their experience that enhances their cognitive development. The picture-based visual communication enables to improve learning and recall (Levie and Lentz, 1982; Lane and Kossslyn, 2009). Furthermore, if there were any questions between the information presented on the current slide and the previous slide, the teacher can click the interactive button on the slide and instantly link to the desired part. The teacher may not lose chances to make important links between more distantly related topics by showing material in a set order. This hyperlink approach to PowerPoint is flexible to the lecture and allows the learners and the instructor together to choose which topics to cover on a particular part. Most of the PowerPoint slides contained texts, images, pictures and tables for conveying concepts. The learning materials are distributed to the learners through Tallinn University of Technology (TUT) e-learning platform. Students were able to download the PowerPoint presentation after class. At the end of semester, the two groups were given the post-test and questionnaire. To minimize errors of the teaching experiments and enhance the internal validity of this study, the control variables for the two groups will be the same during the

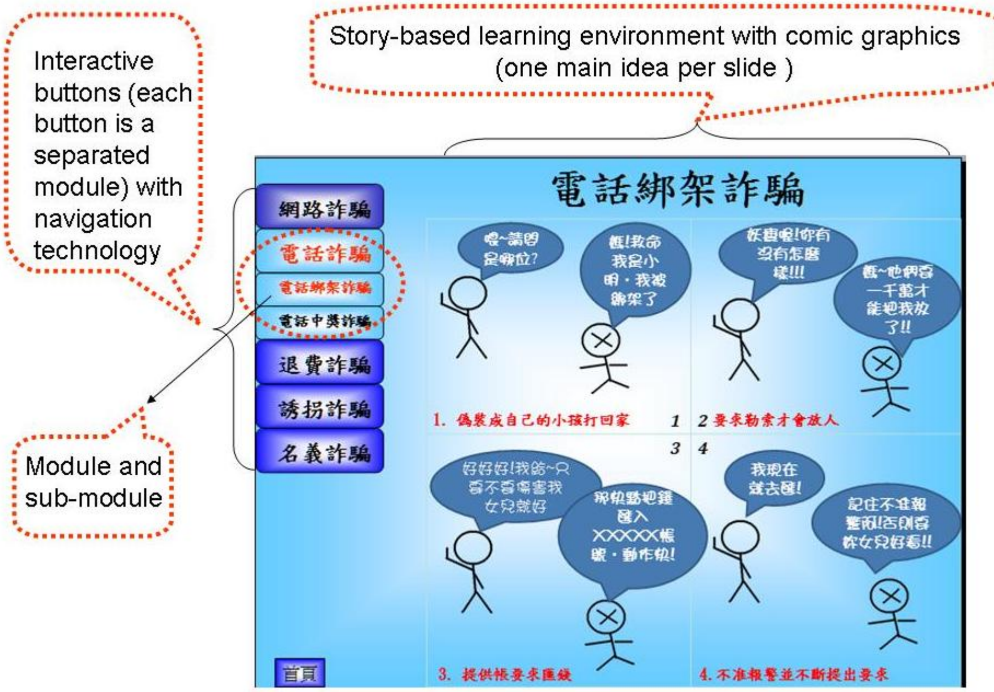

Figure 3. The interactive PowerPoint presentation.

research period. The control variables are included with the same instructor, course scope, assignments and evaluation tools.

Evaluation

Pre-test and post-test were employed in this study; a pre-test was designed to assess the students' prior knowledge, and post-test was designed to measure the students' learning outcomes. The data collections from the students regarding their learning perceptions from lectures with PowerPoint presentation were obtained at the end of the experimental activity. The learning perception questionnaire was adopted and modified from previous surveys (Apperson et al., 2006; Loyd and Gressard, 1986; Susskind, 2008; Lai et al., 2011a, b). The purpose of the questionnaire was to assess their general attitudes, interest and efficacy for the PowerPoint presentation. This was a 16-item survey using a 5-point Likert-type scale (with 1 being strongly disagreed and 5 being strongly agreed) and included positive and negative statements. Thus, in order to explain the survey result, the order of the values on the negative statements was reorganized prior to group calculating them. Then, the higher scores indicate more positive learning perceptions toward the PowerPoint presentation (Lai et al., 2011b). All items are presented in Table 1. Internal consistency reliability of the questionnaire was assessed by Cronbach's alpha (α = .87). The significant level was set at p = 0.05.

RESULTS

The learning perception survey

The analyses of independent t-test and the effect size (Cohen's *d*) was conducted to assess the effects of the experimental group with the interactive PowerPoint presentation and the control group with the traditional linear PowerPoint presentation on the scores of the learning perception.

According to the modality of instructional design (Moreno and Mayer, 2007; Mayer, 2001), the most effective learning environments are combined with verbal and non-verbal representations of the knowledge. Table 1 shows the significant results of the experimental analysis, which indicates that the students in the experimental group found that visual elements (for example, pictures, charts, graphics or tables) were helpful in presentations, $t=3.307$, $p < 0.000$, $d = 0.713$. It showed that the interactive PowerPoint presentation provided the rich visual interactivity and the teacher effectively used the instructional technology to present the teaching materials, $t= 2.905$, $p < 0.001$, $d = 0.630$. Hence, they stated that the instructor's use of the instructional technology helped them pay attention in class, $t=4.285$, $p < 0.00$, $d = 0.932$. They added that the lectures were effective in maintaining their interest, $t= 3.263$, $p < 0.000$, $d = 0.712$.

According to the cognitive theory of multimedia learning (Mayer, 2001), students learned better from words and pictures than from printed or spoken words alone. The slides used anchored instructional theory to conduct a story environment with comic graphics which effectively let students feel that the presentations could promote their understanding of the learning contents, $t = 2.370$, p

Table 1. Means (M), standard deviations (SD) and *t*-test of students' learning perception survey.

Item	Ctrl. (n=40)	Exp.(n=43)	*t*-value	Effect size (Cohen's *d*)
	M (SD)	M (SD)		
I generally found that visual elements (for example, pictures, charts, graphics or tables) were helpful in presentations.	3.33(1.56)	4.23(0868)	3.307***	0.713
I thought the teacher's use of instructional technology while teaching was effective.	3.38(1.56)	4.21(1.01)	2.905**	0.630
The use of instructional technology helps me pay attention in class.	3.25(1.89)	4.63(0.90)	4.285***	0.932
The lectures were effective in maintaining students' interest.	3.35(1.31)	4.14(.861)	3.263***	0.712
The lectures were more organized.	3.55(1.21)	3.84(0.87)	1.242	
The presentations promoted my understanding of the learning contents.	3.40(1.41)	4.00(0.85)	2.370**	0.516
When I studied the material through the TUT platform, I could clearly recall the classroom experience.	3.30(1.11)	3.79(0.80)	2.313**	0.504
I was more confident about the exams.	3.05(1.62)	4.42(1.03)	4.635***	0.913
I had more time to organize notes.	3.35(1.31)	3.12(0.93)	1.117	
Compared to other courses, this course required doing additional work.	3.13(1.04)	2.91(1.02)	0.963	
During the lecture, I took more notes.	3.38(1.08)	2.91(1.01)	2.033	
I generally felt slides that only provided key phrase of the lecture material.	3.30(1.11)	3.53(0.91)	1.056	
Compared to other courses, this course was difficult to understand.	3.65(0.69)	3.13(1.14)	-2.574**	-0.553
Compared to other courses, this course required me to work harder.	3.93(0.83)	3.15(1.15)	-3.576***	-0.780
I could easily discuss the lecture with classmates afterwards.	2.79(0.94)	3.13(1.04)	1.536	
I spent more time studying for exams.	4.05(1.02)	3.30(1.57)	-2.582**	-0.566

< 0.001, $d = 0.516$. They also could recall classroom experiences, $t = 2.313$, $p < 0.001$, $d = 0.504$. Finally, they felt they were more confident for the exams, $t = 4.635$, $p < 0.000$, $d = 0.913$.

Compared to the experimental group, students in the conventional group found it difficult to understand the course, $t = −2.574$, $p < 0.001$, $d = −0.553$. They had to work hard, $t = −3.576$, $p < 0.01$, $d = −0.780$. They spent more time studying for exams, $t = −2.582$, $p < 0.001$, $d = −0.566$. Accordingly, these results reflected that the interactive PowerPoint presentation was helpful for students in the experimental group.

Pre-test and post-test

Table 2 showed the results of pre-test which indicated that the students in both the experimental group and the

Table 2. Means (M), and standard deviations (SD) of the post-test scores.

	Ctrl (n=40)		Exp (n=43)	
	M	SD	M	SD
Pre-test	51.45	8.54	50.55	8.77
Post-test	79.96	0.58	83.71	0.56

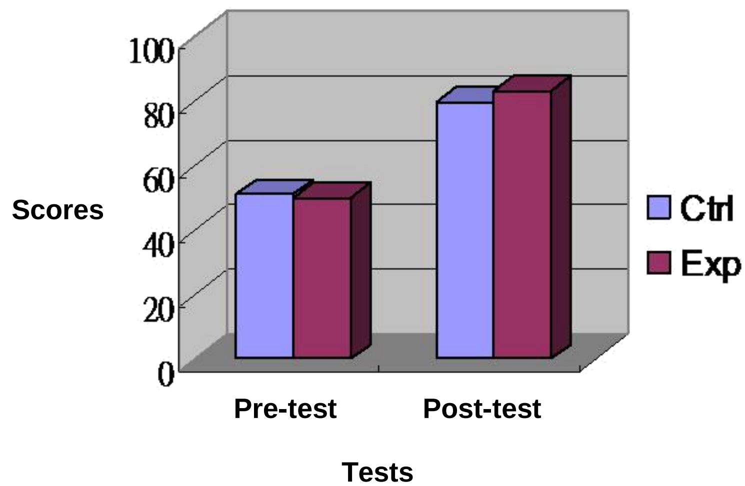

Figure 4. The scores of pre-test and post-test for both groups.

control group had equivalent prior knowledge for learning the "Laws and life" course, t =1.446, $p > 0.05$. A one-way analysis of covariance (ANCOVA) was conducted on the post-test, with the pre-test scores as prior knowledge used as a covariant to exclude the factor of prior knowledge by the students. This factor could affect the assessment of the students' learning achievement. After confirming the requirement of homogeneity of within-cell regressions, F = 2.715; $p > 0.05$, the ANCOVA has been conducted. The results revealed no significant difference between the two groups on the post-test, F = 21.190, $p > 0.05$. This could be due to the post-test which was the final term examination at school so as to make both groups study very hard and spent sufficient time in learning no matter what kind of tools were provided (Lai et al., 2011b). However, the progress between pre-test and post-test of experimental group was still higher than that of control group. This could be the anchored-designed content and interactive multimedia presentation way stimulated the students' interests and maintained their retention (Figure 4).

DISCUSSION

The findings of this study are consistent with Mayer's (2001) cognitive theory of multimedia learning, and we applied this theory to the interactive PowerPoint presentation complete with anchored instruction strategy. We concluded the findings as following:

First, the interactive PowerPoint, with a more visual and thematic presentation could facilitate learning. According to Mayer's (2001) cognitive theory of multimedia learning, students who selected from both graphic and text modes were able to build more referential connections between the verbal and visual mental representations(Lai et al., 2011a). In addition, researches showed that the instructional context could strongly affect students' motivation because the instructional materials that are challenging, optional and promote perceived self-control and autonomy can effectively motivate the students (Hidi and Harackiewicz, 2000; Olmanson et al., 2011).This study employed the anchored instruction strategy with the rich comic graphics and animations to lead the students involving in the "story" that best fit their needs and preferences (Jones and Plass, 2002). All related activities would be designed around a "story"; this approach would encourage students become more actively engaged in learning by situating or anchoring instruction around an interesting topic and thereby reinforcing their learning (Bransford and Stein, 1993; Prado and Gravoso, 2011). Thus, the interactive PowerPoint presentation accompanied by the anchored instruction strategy helps students to acquire more information and remember more ideas.

Second, a coherent, explicit and systematic presentation is beneficial for students (Tufte, 2003). The interactive PowerPoint presentation incorporated hyperlinks and hierarchical design strategies that provided the teacher with the flexibilities and efficiency in managing the presentation slides. The teacher also easily changed and selected the particular slide to help student with their questions, thereby helping the cognitive process in the comprehension of the content being taught (Hasler et al., 2007; Wallen et al., 2005). However, in the traditional PowerPoint display environment, teacher cannot quickly move and change the desirable slides to explain two successive or separated slides. The instructor may lose chances to make important links between more distantly related topics by showing materials in a set order. This may result in decreasing a student's ability to solve a particular problem. Through the experiment, we found that the interactive buttons with the hyperlink approach to PowerPoint builds in flexibility to the lecture and allows the students and the teachers together to pick and choose the appropriate topics (Matheson et al., 2002). This approach differentiates with the traditional linear presentation. Besides, adding animation to fade in the contents and graphics part by part can get the attention of students right away, capturing their attention and encouraging them to learn more about the course being promoted.

Finally, from the viewpoint of the instructional design, this study conducted the modularity concepts into the interactive PowerPoint. During both the planning process and the actual construction, this strategy keeps the entire material modular and reusable. The strategy enables to provide the benefits of simplifying a vast quantity of slides, developing modules independently, loading or reusing modules from different locations and minimizing download time. Furthermore, the content can be updated without much effort and in a timely manner to match the training/learning needs (Shah, 2011). This is a much more cost-effective and time-efficient approach for instructional design.

Conclusion

This study utilized the anchored Instruction strategy and modularity concept to construct a multimedia leaning environment to promote the positive effects of the interactive PowerPoint presentation in classroom learning. Within the network presentation designed, the content was hierarchically arranged and navigable; the teacher could simultaneously show what he/she said, regardless of where the interaction leads, his/her message would take greater significance. As for students, a good presentation meant being coherent, explicit, and a clear structure. This study integrated the anchored instructional strategy into PowerPoint presentation materials was helpful for students to understand the learning contents because the topics could be relevant to their daily lives and presented with the story-based manner. Accordingly, this learning environment allows students to create more cognitive paths to facilitate the construction of referential links and mutual references between two channel representations (Lai et al., 2011a; Chen et al., 2011). Finally, the survey results of this study have shown that students in the experimental group had a more positive attitude toward learning than students in the control group. This study does show that, under certain circumstances and limitation of time and expenditure, the interactive multimedia PowerPoint can produce better results than other methods. The significant findings of this study can be applied in further research on different types of professional development leaning or training (Chen et al., 2011). The results have wide implications for school or business training, where on-demand learning, cost and loss of revenue from travel and instruction often determine the mode and method for learning or training. Thus, implications exist for a variety of education and businesses that are tasked with learners and delivering cost-effective professional development programs.

However, There is still room to improve in this study: the scope of the study was limited: the success of interactive PowerPoint may be varied by content and some topics or courses may be better-suited to learning than others; samples of participants drawn from one university were examined in this experiment and thus, the results could reflect a bias. Further expansion of the scope and subjects is needed for the future study.

REFERENCES

Apperson JM, Laws EL, Scepansky JA (2008). An assessment of student preferences for PowerPoint presentation structure in undergraduate courses. Comp. Edu., 50(1):148-153.

Baddeley A (2002). Is working memory still working? Eur. Psy., 7(2): 85-97.

Baker EA (2009). Multimedia case-based instruction in literacy: pedagogy, effectiveness, and perceptions. J. Educ. Multimed. Hypermedia, 18(3):249-266. Chesapeake, VA: AACE.

Bartsch RA, Cobern KM (2003). Effectiveness of PowerPoint presentations in lectures. Comp. Edu., 41(1): 77-86.

Beyer AM (2011). A Comparison of Simplified-Visually Rich and Traditional Presentation Styles. Teach. Psychol., 38: 293-297.

Chandler P, Sweller J (1991). Cognitive load theory and the format of instruction. Cogn. Instr., 8(4): 293-332.

Chen YT, Chen TJ, Tsai LY (2011). Development and evaluation of multimedia reciprocal representation instructional materials, IJPS, 6(6): 1431-1439.

Corbeil G (2007). Can PowerPoint presentations effectively replace textbooks and blackboards for teaching grammar? Do students find them an effective learning tool? CALICO J., 24(3): 631-656.

CTGV (1993). Anchored instruction and situated cognition revisted. Edu. Tech., 33(3): 52- 70.

Gabriel Y (2008). Against the tyranny of PowerPoint: technology-in-use and technology abuse. Gabriel. Org. Stu., 29(2): 255-276.

Glaser CW, Rieth HJ, Kinzer CK, Peter J (1999). A description of the impact of multimedia anchored instruction on classroom interactions. J. Spe. Edu. Tech., 14(2): 27-43.

Gupta ML (2010). Interactive teaching and learning by using student response systems. Inter. J. Learn., 17 5: 371-384.

Hasler BS, Kersten B, Sweller J (2007). Learner control, cognitive load and instructional animation, Appl. Cogn. Psy., 21: 713-729.

Hidi S, Harackiewicz JM (2000). Motivating the academically unmotivated: A critical issue for the 21st century. Rev. Educ. Res.,

70(2): 151-179.
Hu H (2011). Tired of feeling trapped inside your linear PowerPoint slide shows? http://alexhhu.weebly.com/demo-library.html
Jones LC, Plass JL (2002). Supporting listening comprehension and vocabulary acquisition in French with multimedia annotations. Mod. Lan. J., 86(4): 546-561.
Kalyuga S (2007). Enhancing instructional efficiency of interactive e-learning environments: A cognitive load perspective. Edu. Psy. Rev., 19(3): 387-399.
Kellogg MS (2010). Pre-service elementary teachers' pedagogical content knowledge related to area and perimeter: A teacher development experiment investigating anchored instruction with web-based micro worlds theses and dissertations. http://scholarcommons.usf.edu/etd/1679
Kelly R (2009). A modular course design benefits online instructor and students, http://www.facultyfocus.com/articles/online-education/a-modular-course-design-benefits-online-instructor-and-students/
Kumar DD (2010). Approaches to interactive video anchors in problem-based science learning, J. Sci. Edu. Tech., 19(1): 13-19.
Lai YS, Tsai HH, Yu PT (2009). A multimedia English learning system using HMMs to improve phonemic awareness for English learning. Edu. Tech. Soc., 12(3): 266-281.
Lai YS, Tsai HH, Yu PT (2011a). Screen-capturing system with two-layer display for PowerPoint presentation to enhance classroom education. Edu. Tech. Soc.,14(3): 69-81.
Lai YS, Tsai HH, Yu PT (2011b). Integrating annotations into a dual-slide PowerPoint presentation for classroom learning. Edu. Tech. Soc., 14(2): 43-57.
Lane R, Kosslyn S (2011). Show me! what brain research says about visuals in PowerPoint, http://office.microsoft.com/en-gb/powerpoint-help/show-me-what-brain-research-says-about-visuals-in-powerpoint-HA010277194.aspx
Lane R, Wright R (2009). And the research says? PowerPoint meets cognitive science, http://office.microsoft.com/en-us/help/and-the-research-says-powerpoint-meets-cognitive-science-HA010198311.aspx
Levie WH, Lentz R (1982). Effects of text illustrations: A review of research. Edu. Comm. Tech. J., 30(4): 195-232.
Li L, Mao MJ, Xu L (2010). Application of concept maps-based anchored instruction in programming course, Computer and Information Technology (CIT), 2010 IEEE 10th International Conference on Bradford.
Liao YKC (2007). Effects of computer-assisted instruction on students' achievement in Taiwan: A meta-analysis. Comp. Edu., 48(2): 216-233.
Lightfoot JM (2005). Integrating emerging technologies into traditional classrooms: A pedagogic approach. Int. J. Instr. Med., 32(3): 209-224.
Lowry RB (1999). Electronic presentation of lectures: Effect upon student performance. U. Chem. Edu., 3(1): 18-21.
Loyd BH, Gressard CP (1986). Validation studies of a new computer attitude scale. Asso. Edu. Data Sys. J., 18(4): 295-301.
Matheson VA, Abt-Perkins D, Snedden D (2002). Making PowerPoint interactive with hyperlinks. http://www.economicsnetwork.ac.uk/advice/powerpoint.pdf
Mayer RE (2001). Multimedia learning. Cambridge: Cambridge University Pres, pp. 22-58.
Mayer E, Anderson R (1991). Animations need narrations: An experimental test of a dual-coding hypothesis. J. Edu. Psy., 83(4): 484-490.
Mayer RE, Moreno R (2003). Nine ways to reduce cognitive load in multimedia learning. Edu. Psy., 38(1): 43-52.
Moreno R, Mayer R (2000). A coherence effect in multimedia learning: The case for minimizing irrelevant sounds in the design of multimedia instructional messages. J. Edu. Psy., 92: 117-125.
Moreno R, Mayer R (2007). Interactive multimodal learning environments. Edu. Psy. Rev., 19(3): 309-326.
MSDN (2009). Modularity, The ideal problem solver (2nd Ed). New York: Freeman.http://msdn.microsoft.com/en-us/library/ff921069(v=pandp.20).aspx
Muthukumar SL (2005). Creating interactive multimedia-based educational courseware: Cognition in learning. Cog. Tech. Week, 7(1): 46-50.
Pellegrino JW, Brophy S (2008). From cognitive theory to instructional practice: technology and the evolution of anchored instruction, III, pp. 277-303.
Plass JL, Chun DM, Mayer RE, Leutner D (2003). Cognitive load in reading a foreign language text with multimedia aids and the influence of verbal and spatial abilities. Comp. Hum. Beh., 19(2): 221-243.
Prado MM, Gravoso RS (2011). Improving high school students' statistical reasoning skills: a case of applying anchored instruction, Asia Pac. Educ. Res., 20(1): 61-72.
Rankin EL, Hoaas DJ (2001). The use of PowerPoint and student performance. Atl. Eco. J., 29(1): 113.
Schmidt A, Bandar Z (1998). Modularity - a concept for new neural network architectures. IASTED International Conference on Computer Systems and Applications (CSA'98) in Irbid/Jordan.
Schramm W (1977). Some notes on research, theory, and production in instructional television. Bloomington, Ind.: Agency for Instructional Television Reprinted in Pub Tele-comm. Rev., 5(4): 11-21.
Susskind JE (2008). Limits of PowerPoint's power: Enhancing students' self-efficacy and attitudes but not their behavior. Comp. Edu., 50(4): 1228-1239.
Sweller J (1999). Instructional designs in technical areas. Melbourne: ACER Press, pp. 88-122.
Taylor L (2004). Considerations of choosing an English-English dictionary for ESL students, Int. TESL. J., 10(7): 33-55.
Tufte E (2003). The cognitive style of PowerPoint. Cheshire, CT: Graphics Press, pp. 47-89.
Wallen E, Plass JL, Brünken R (2005). The function of annotations in the comprehension of scientific texts: Cognitive load effects and the impact of verbal ability. Edu. Tech. Res. Dev., 53(3): 59-71.
Zhang D, Zhao JL, Nunamaker JF (2004). Can e-learning replace classroom learning? Communication of the ACM, 47(5): 75-79.