International Journal of Physical Sciences Vol. 7(6), pp. 957 - 965, 2 February, 2012
Available online at http://www.academicjournals.org/IJPS
DOI: 10.5897/IJPS11.1788
ISSN 1992 - 1950 © 2012 Academic Journals

Full Length Research Paper

The effect of thematic video-based instruction on learning and motivation in e-learning

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Accepted 23 January, 2012

The purpose of this study was to develop and evaluate the video on demand learning system. This study integrated the thematic instructional strategy into interactive video-based instruction based on the cognitive theory of multimedia learning and investigated the participant's reflection and learning performance through post-test, IMMS and the experimental teaching activities. Under the self-controlled learning environment, students could easily hyperlink the particular segment they need so as to reduce student's extraneous cognitive load. Also, the video presented the concise textual and pictorial learning elements simultaneously which could benefit to reinforce their learning. Accordingly, the findings of this study revealed that the interactive thematic video could promote students more engaged and acquired more information and remembered more ideas. Furthermore, the students in the experimental group could get the higher posttest scores and learning motivation than those of the control group.

Key words: Thematic strategy, Interactive video on demand learning system, the cognitive theory of multimedia learning, instructional material motivational survey (IMMS).

INTRODUCTION

Using video-supported technology to deliver learning is the latest trend in e-learning. But videos often cause superficial learning and thereby restrict sustainability of learning outcomes and even no transfer that is the well known 'couch-potato-attitude'. One of the problems is that the instructional materials have not been well-organized (Lee, 2001). Traditionally, teaching activities are always followed in chapters accordingly in the textbook. Under this circumstance, students easily have a passive attitude of learning and hardly enjoy learning and develop independent thinking. Students may not really understand what they have learned and even more unlikely to apply these knowledge in their life experience. Nevertheless, according to previous studies, thematic instruction can increase student motivation and achievement (Shapiro et al., 2011; Cervetti et al., 2009). Probing the findings, thematic instruction not only organizes activities or lessons around a general idea or theme meaningful to the learner but also motivates students to engage in self-directed learning through the guide, cooperation, and exploring modes of learning (Lesley and Matthews, 2009).

Accordingly, the aim of this study is to integrate the thematic instruction strategy into interactive video-based instruction for empirical study and evaluate the outcomes. Hopefully, the results of this study can have a greater insight into the implement and delivery of quality e-learning courses and programs. The rest of this paper was organized as follows. First, we presented a literature review. Next we developed the methodology. Finally, we presented our discussion, conclusion and suggestions.

LITERATURE REVIEW

Thematic strategy

Traditional teaching is based on units, subjects, chapters, sections for the elements of instructional design; the character of teacher is delivered in these arranged units to the students with fragmentary and one-way method. However, thematic instruction uses the themes to organize the curriculum (Funderstanding.com, 2011).

Thematic instruction strategy is based on the idea that

is usually related to the learners' life experience and thereby easily raises learners ' interest and engagement in the content. Thematic instruction involves using a theme as a star point for learners, strengthening bonds to knowledge. In this approach, teachers will effectively employ strategies to involve learners not just in ways that are exciting or fun, but that make strong connections between abstract ideas and understanding. Teachers should have a clear understanding of the material and realize what ideas need to be taught and how best to teach them. Teachers also must know how students learn what they already know and how much more they need to learn (Honiotes, 2011). In thematic instruction activity, for designing curriculum, instruction methods, and assessment, teachers will integrate many related subjects in that particular grade work together around a preselected theme. Typical steps include: choosing a theme, designing the integrated curriculum, designing the instruction and evaluating the outcomes. Accordingly, thematic instruction can be a powerful tool for restructuring the curriculum and discarding the isolated, reductionist nature of teaching around disciplines rather than experience.

The video-supported in e-learning

Video, one of the most diversify and powerful virtual learning medium, captures and presents information and offers a sensory learning environment that enhances learners to understand more and retains information better (Fern et al., 2011). It integrated the various media such like voice, animation, data, and text for transferring the learning (Stonebraker and Hazeltine, 2004). Nugent compared several presentations and found that the combination of auditory and visual information in material gets better retention than those presented through a single information source (Nugent, 1982). Compared to the traditional classroom methods, video learning is student-centered, asynchronous, and available anytime and anywhere (Todd et al., 2011). This technology provide the "new, better, cheaper, and faster" ways to transfer the learning (Fathi et al., 2011; Taylor, 2002). In early instructional studies, the video was primarily either broadcasted through TV programs or stored on CD-ROMs. The linear nature of such video instructions produced inconsistent results (Ulges et al., 2010). However, videos often cause superficial learning and thereby restrict sustainability of learning outcomes and even no transfer that is the well known 'couch-potato-attitude' (Ertelt et al., 2006). Recently, due to the development of network bandwidth and multi-media technology, the interactive video has been used widely in e-learning system. Interactive video used a non-linear, interactive digital video technology which allows students to pay full attention to the learning material and to review any video part as many times as they want (Dimou et al., 2009; Weston and Barker, 2001). Users can randomly select or play a segment with minimal search time (Llinares and Valls, 2010; Zhang et al., 2004). This may enhance learner engagement, and so improve learning effectiveness. Accordingly, for enhancing student's learning performance, most schools often use these technologies as a supplement to traditional corporate education programs (http://www.sciencedirect.com/science/article/pii/S0747563208002252 (Arguel and Jamet, 2009; Kumar, 2010; Panucci, 2002)).

Cognitive theory of multimedia learning

Multimedia learning is learning from verbal and visual information (Mayer and Moreno, 2003). Verbal information included the written form of printed words and the oral form of spoken language and any represented by pictorial forms. According to the dual coding theory, brain clearly handles visual content differently than it does textual information (Lane and Wright, 2009; Lai et al., 2011a; Chen, 2012). 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, learners 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. 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 improved learners' learning and recalling (Levie and Lentz, 1982). Therefore, pictures and graphics, especially, are powerful communication tools if used correctly (Lai et al., 2011b). However, when the learning process occurs in the working memory, a cognitive load which is essential for learning will be imposed (Baddeley, 2002). The cognitive load is related to the human information processing capacity. Based on the properties of the task being displayed, three categories of the cognitive load describe different sources of working memory load, related to the complexity of the material (intrinsic load), the instructional design (extraneous load), and the amount of mental effort learners invest in learning the materials (germane load) (Brünken et al., 2003; Paas et al., 2003; Sweller, 1999). In many circumstances, individual learners bear the burden of deciding when to use additional learning facility and what forms of facility to request. While more advanced learners could deal with such a burden, it may be beyond the cognitive resources that are available to less experienced learners (Kalyuga, 2009).

METHODOLOGY

Our major research question was: Does interactive video with the thematic instruction enhance the learner's learning effectiveness

and motivation? The dependent variables were learning effectiveness, as measured by students' test scores, and perceived learner motivation, as measured by a survey instrument. In this research, to allow easily self-study and real-time access to knowledge, the interactive thematic video-base instruction was designed and implemented to provide a non-linear, interactive, concisely marked key steps and personalized online learning environment. Therefore, we hypothesized that interactive thematic video would improve learning attitude and performance. The hypotheses were made as the following:

H_1: Students who use the interactive thematic video will achieve better post-test scores than do students who use non-interactive (traditional) video.
H_2: Students who use the interactive thematic video will achieve better learning motivation than students who use non-interactive (traditional) video.

The well-known of instructional design models are Dick and Carey's Model of Instructional Design and the Instructional Systems Development (ISD) model, colloquially known as ADDIE (Molenda, 2003; Wetterling, 2006; Chyung, 2007). 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 which includes five stages: (1) Analysis, (2) Design, (3) Development, (4) Implementation, and (5) Evaluation. It is a general-purpose model, suitable for the participation of small sample population, and often used to study issues related to education (Taylor, 200; Chen et al., 2011). This study is based on ADDIE model to develop and evaluate an interactive video.

Participants

This experiment was motivated by the need of 85 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 "Computer Application Software – learn with Microsoft office skills", 36-hours workshop, was a required general education course for first-year university students. Excluding the unusable surveys which were either incomplete tests or questionnaire or not followed instructions were identified and discarded. As a result, 76 respondents (89% of 85 cases) were used as the basis for data analysis. Of these participants, 46% were males, and 54% were females. Each subject participated in the study was randomly assigned to experimental group (n = 41) and control group (n = 35).

Procedure

This study developed and evaluated the interactive video followed by the ADDIE model and also employed two tests: Pre-test, post-test and questionnaires.

Analysis

To exclude the factor of digital divide, in the first week of the classes, the participants were required to take pre-test regarding their experiences of using Microsoft office software and other related applications to check the effects of computer literacy and experience on the findings, thereby improving the internal validity of the study.

Design

This study uses the video as the experimental medium because video is a gradually popular and easily accepted medium. Furthermore, previous studies have constantly suggested that video-based learning can effectively enhance learners to understand more and retains information better (Palubeckis et al., 2010; Lee et al., 2011; Leijen et al., 2009; Zhang et al., 2006). For preventing the passive learning attitude and attracting learner's interesting, this study implements an interactive video with thematic instructional strategy for experimental group. In the study, the experimental group (41 people) was taught with thematic video-based materials; whereas the control group (35 people) was taught with the traditional video-based materials which were edited chapter by chapter accordingly in the textbook. After the experimental activity, these two groups were given post-test and questionnaires. To minimize errors of the teaching experiments and enhance the internal validity of this study, the control variables for the two groups were the same during the research period. The control variables included the same instructor, course scope, assignments, evaluation tools and students' cognitive abilities of using the Microsoft office skills software.

Development

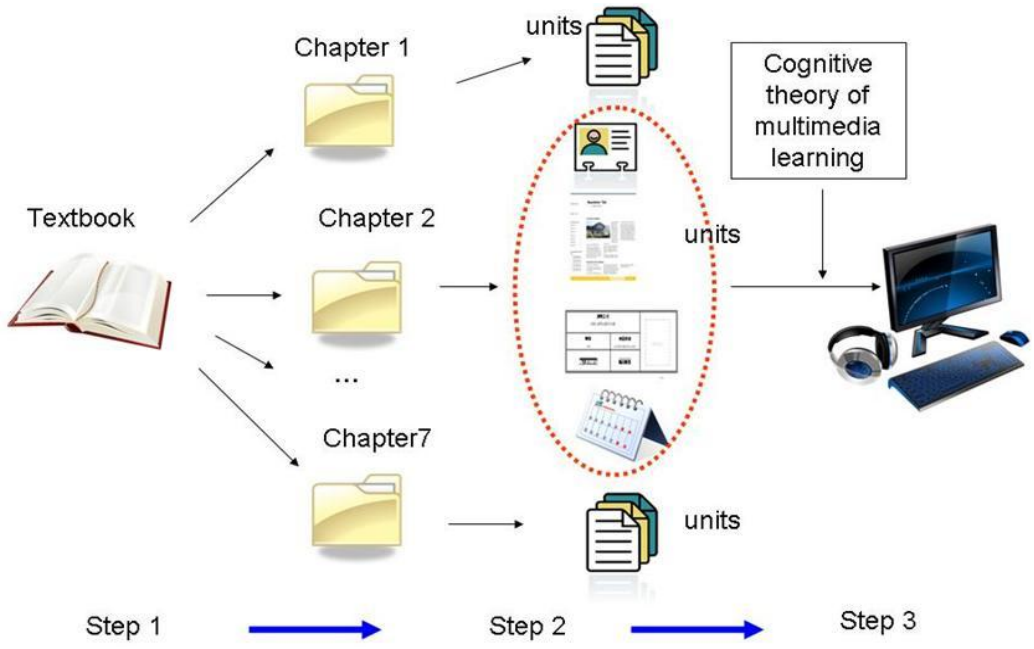
According to cognitive load theory (Kirschnera et al., 2011; Aggarwal et al., 2001), human working memory capacity is limited, and that overloading working memory hinders learning. In order to foster learning and transfer, the solution process of a complex task may be divided into small, meaningful building blocks. Hence, for our research, we logically segmented the content into small control buttons which allow learners random "on-demand" access to any particular part. For experimental group, we segmented the content with some thematic which is related to students' life experience (Figures 1 and 2), but for control group, the content was segmented by following the chapters in the order of the textbook (Figures 3 and 4). We also used multimedia technologies such as various colorful buttons, step-by-step visual indicators, arrow prompts, zooming technology etc., to draw viewers' attention to specific action in the video. Concise key prompts and narration provides helpful explanation. Learners can use the control bar which below the interface to stop, play and rewind the video. Summary and exercise (feedback) was also provided after each learning unit (Figure 5).

Implementation

The learning materials are distributed to the learners through TUT e-learning platform. The TUT e-learning platform provided by Tainan University of Technology in Taiwan, is a flexible e-learning and e-working platform allowing teachers to build effective online courses and to manage learning and collaborative activities on the web. The learning environment of this research was designed and framed as a software tutorial where subjects had to learn a new computer application. In the first week, the objective and procedure of the experiment were clearly described. Participants of the two groups received about 10 min of training during which they saw a brief live demonstration about how to watch an online lecture using the interactive video learning materials. At the next few weeks, we conducted the experimental activities. The blended teaching strategy has been employed for the participants; at the beginning, the teacher explicated and demonstrated the instructional contents and then asked participants to practice the exercise by themselves. They could repeatedly watch the video-based learning materials from the platform.

Evaluation

For evaluating students' learning performance and motivation, post-test and questionnaires were given to all participants at the end of

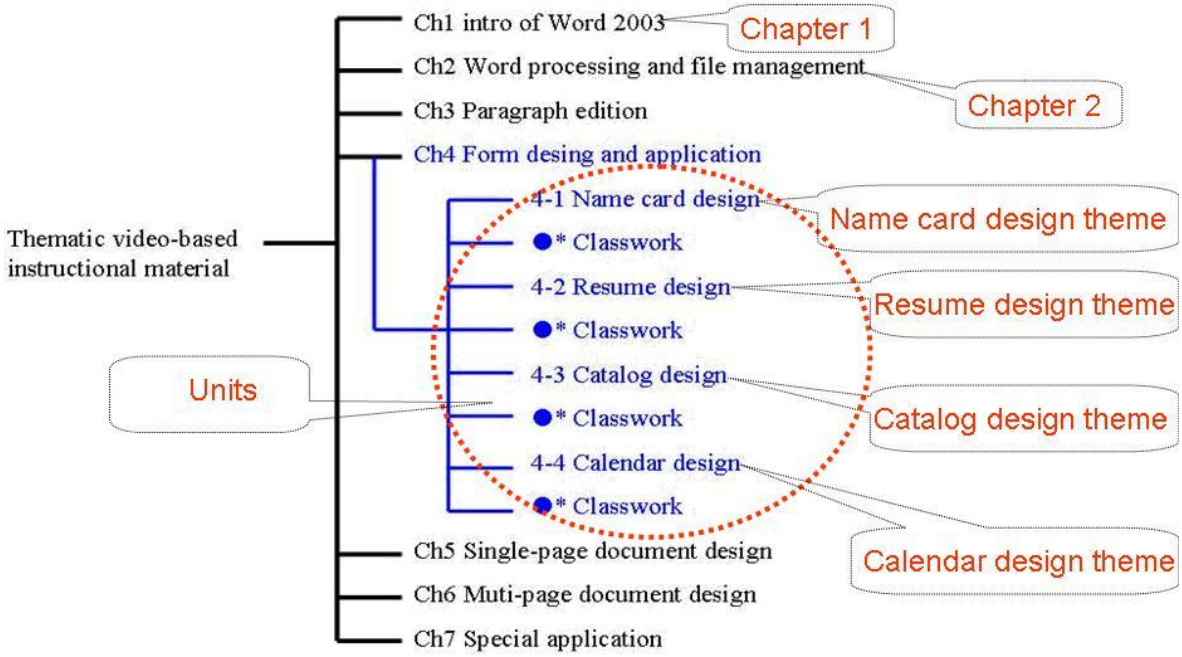


Step 1: cataloged the textbook contents into different chapters.

Step 2: each chapter includes many units with special theme.

Setp3: based on the cognitive theory of multimedia learning to implement the materials.

Figure 1. Integration of the thematic instructional strategy into materials.



Chapters were cataloged by related contents. Each chapter has included some units with special themes which related with the life experience.

Figure 2. The outline of thematic video-based instruction material, an example of form design and application.

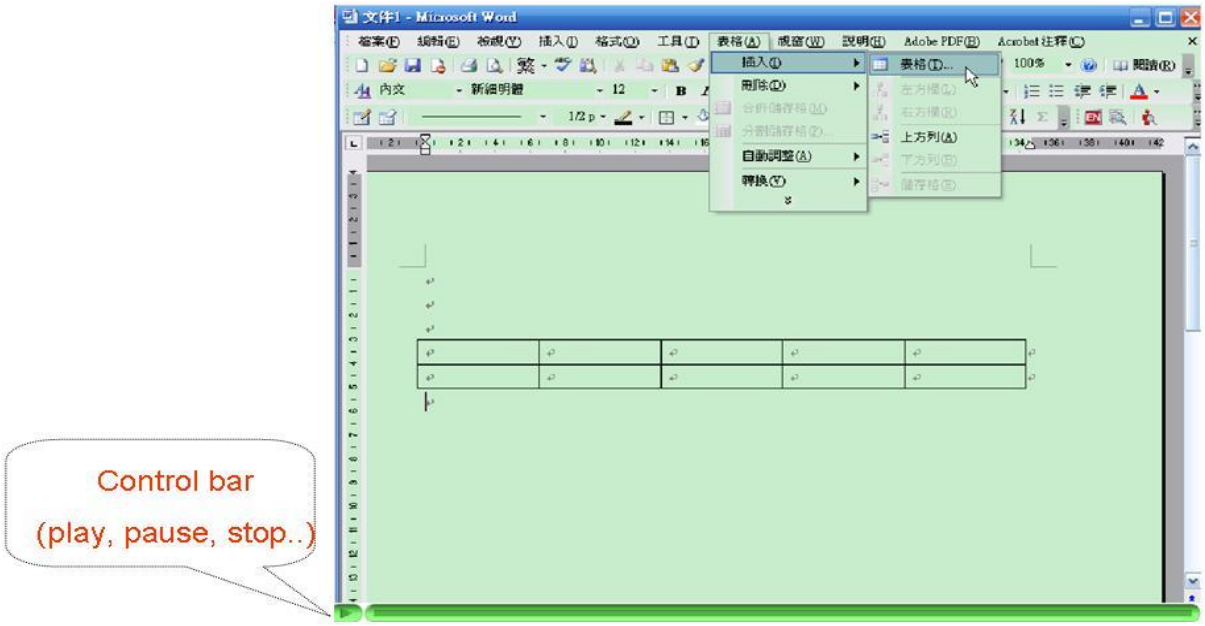


Figure 3. The traditional video with linear presentation.

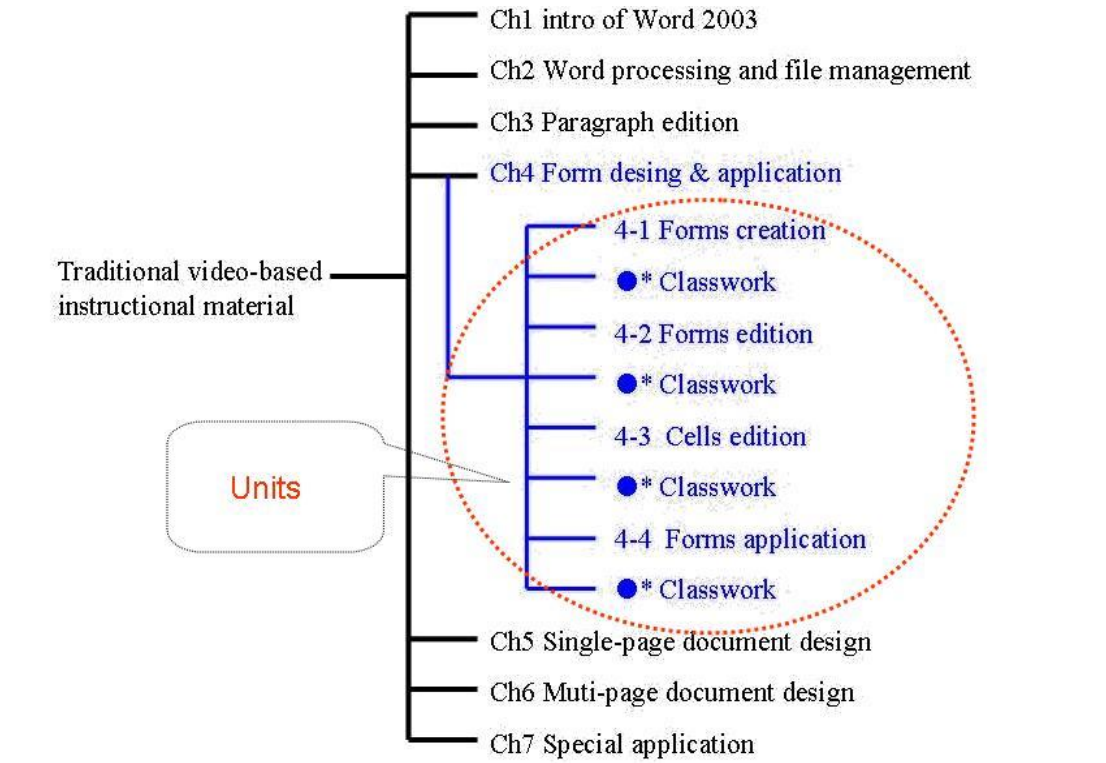


Figure 4. The outline of traditional video- an example of form design and application.

Figure 5. The presentation of thematic video-based material.

the experimental session. Researcher compiled the post-test based on participants' learning progress and how well participants understand the materials. Besides, we provided closed-end questionnaire. This study modified and adopted the closed-end questionnaire from the ARCS motivation model proposed by Keller (1983). The four constructs in this model include attention, relevance, confidence and satisfaction; they describe the motivational procedure: While keeping the learners' attention is critical, instructors will provide an interactive and participative environment to gain and maintain learners' attention; learners will feel relevant that the course content, activities, and assignments must be related to their personal and professional goals, confident that they can achieve the expected outcomes of the course and satisfaction derive from the instruction (Johnson and Aragon, 2003). The questionnaire, instructional material motivational survey (IMMS), overall motivation to learn was evaluated. IMMS developed around Keller's ARCS model of motivational design was designed to evaluate how instructional materials affected the motivation for learner (Keller, 1983). It contains a 36 7-point Likert scale statements, ranging from extremely dissatisfied (1) to extremely satisfy (7), as well as to provide open comments on the system. Each statement measures an individual ARCS component. In order to minimize possible error because of participants' varying levels of English comprehension, a Chinese version of the questionnaire was used, with the Chinese version of IMMS administered by ESL/EFL and translation experts to prevent any translation mistakes.

RESULTS AND ANALYSIS

After testing and distributing the questionnaires, the researcher gathered the responses and used Statistical Package for the Social Sciences (SPSS) for Windows, a statistical program, for data analysis. The data collected was coded and entered into a computer by optical scoring, and analyzed using SPSS. Descriptive statistics, including frequencies, means and standard deviations, were reported in order to understand the learners' performance. T-tests were used to determine the effects of experimental course. The standard for significance in this study was < 0.05

Pre-test

This study used the Levene's test to conduct homogeneity of variance. The Levene's tests showed that before the experimental activity, regarding the pre-test, the t value and the significance level ($t = 1.704$, $p = 0.093 > 0.05$) showed that the testing results did not reach a significant level, indicating that before the experimental activity, the two groups' initial cognitive abilities were the same.

Post-test

A one-way analysis of covariance (ANCOVA) was conducted on the posttest, with the pretest scores as prior

Table 1. Means (*M*), and standard deviations (*SD*) of the Posttest scores.

Score	Ctrl (n=35)		Exp (n=41)	
	M	***SD***	***M***	***SD***
Posttest	80.15	5.12	80.15	5.12

Table 2. The summary of participants' reaction for the experimental activity.

Component	Experimental group		Control group		t-Value	Significance
	Mean	SD	Mean	SD		
Attention	23.415	5.861	22.571	6.951	2.244	0.028*
Relevance	27.951	7.717	22.427	6.630	3.316	0.001 **
Confidence	26.878	7.040	23.457	6.908	2.130	0.037*
Satisfaction	27.342	5.151	24.514	5.782	2.254	0.027*

*significant at <0.05, **significant at <0.01, ***significant at <0.001.

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, $F = 2.364$; $p > 0.05$, the ANCOVA was conducted. The results revealed significant difference between the two groups on the posttest, $F = 4.447$, $p < 0.05$. The finding indicated that students in the experimental group had higher posttest scores than those in the control group (Table 1).

Questionnaire

IMMS

The reliability of the IMMS, as assessed by Cronbach alpha for internal consistency, was 0.872. For the four components (attention, relevance, confidence, and satisfaction) of IMMS, Cronbach alpha was between 0.837 and 0.878. Thus, the reliability of the questionnaire surveys is quite good. To confirm validity, this study invited several scholars to provide their suggestions, give appropriate modifications and corrections, and integrate relevant questions and content to establish the validity of the questionnaire survey scale. Considering the two experimental conditions, there are differences in motivation (ARCS model) among the different conditions: attention: $t = 2.244$; $p = 0.028 < 0.05$, relevance: $t = 3.316$; $p = 0.001 < 0.05$, confidence: $t = 2.130$; $p = 0.037 < 0.05$, and satisfaction: $t = 2.254$; $p = 0.027 < 0.05$). Table 2 shows the means and standard deviations of learning motivation of participants in different experimental groups.

DISCUSSION

Students in this case study revealed that interactive thematic video is helpful in the learning. The findings of this study are consistent with cognitive theory of multimedia learning (Mayer, 2001). We summarized them as the following.

The Taiwan government successfully rooted the National Information Infrastructure (NII) project

Before the experimental activity, the results of pretest showed that two groups' initial cognitive abilities were the same. It could be that the results of Taiwan's government were successfully rooted in her own National Information Infrastructure (NII) project since June 1994. The goal of NII is to expand the information superhighway to every household, office, factory and school and decrease the digital divide. NII tries to provide an accessible and affordable information network for every citizen in Taiwan (Chen et al., 2001).

The noticeable visual indicators and self-controlled learning environment could benefit for student's learning retention

Excluding the pretest scores because they could affect the assessment of the students' learning achievement, the findings of the posttest revealed that students in the experiment group gained higher scores than those in the control group. This could be due to the noticeable visual indicators and self-controlled learning environment. Based on the schema acquisition and the borrowing and reorganizing principles of cognitive load theory (Guttormsen and Zimmermann, 2007), the recorded materials could help students to construct the plentiful information in long-term memory (Leahy and Sweller, 2008; Chen et al., 2011). Namely, they could almost recall learning activities in the class situation. This is a benefit to

transform the knowledge of the teacher's problem-solving skills to the students (Lai et al., 2011a). Consequently, Hypotheses 1 received support.

The interactive thematic instructional materials could fit students' needs, enhanced their engagement and thereby improve their learning effectiveness

The results of the IMMS indicated that the learning attitude of experiment group is more positive than those of the control group. Compared with the traditional linear video, the interactive thematic instructional materials could provide the thematic instruction which fitted students' needs and preference, especially, as they could randomly hyperlink to a segment with minimal search time which could enhance their engagement, and so improve learning effectiveness (Chen, 2012). Hence, the students in the experiment group had a higher learning cognitive. Consequently, hypotheses also received support.

Conclusion

As for students, a good presentation meant being coherent, explicit, and a clear structure. This study stranded on the cognitive theory of multimedia learning to integrate the thematic instructional strategy into interactive video to promote the positive effects in learning. The experimental results showed that under a self-controlled and real time learning environment, the interactive thematic video not only provided the themes related to students' daily lives but also supplied the referential connections between the visual and verbal mental representations which could be built for the teaching contents by using Conceptual Association Component (Bartsch and Cobern, 2003; Cavanaugh et al., 2008). Accordingly, the interactive thematic video could help students to understand the learning content and get their high satisfaction in learning.

LIMITATION AND SUGGESTION

It is found that incorporating thematic instructional strategy into video-base material suggested in this study is shown to be able to promote motivation and learning effectiveness for university of technology students. However, this study has room for improvement:

1. The scope of the study was limited: The success of this study may be varied by content and some topics or courses may be better-suited to e-learning than others.
2. A non-random sample of students drawn from one university of technology was examined in this experiment and thus results may reflect a bias. Further expansion of the scope and subjects is needed for the future study.
3. Employing cooperative grouping in the future study. Using small, cooperative learning groups to support problem-solving and cooperation will allow students to construct new knowledge, engage individual students, and promote self-direction, autonomy, team work and communication skills (Attle and Baker, 2007).
4. Employing more effective variables such as learner's personalities, learning cognitive attitudes, learning environment and various types of instructional materials may deeply conduct the research results.

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