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Better Video - Streaming Lessons among Palestinian Teachers

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Abstract

This study aimed to investigate the effects of redundant information in video streaming of ICDL course for Palestinian trainee-teachers. Two modes of video streaming were used, namely video and narration (VN) mode, and video and narration cum text (VTN) mode of ICDL course. The sample consisted of 203 trainee-teachers in the National Institute for Training (NIT) in Gaza. The results showed that redundancy in the VTN mode increases cognitive overload and split attentions; hence inhibiting the learning process. The Findings showed that trainee-teachers using the VN mode performed significantly better in post-test scores than counterparts in the VTN modes.

Keywords: Redundancy, Video streaming, ICDL.

1. Introduction

The National Institute for Training (NIT) at the Ministry of Education and Higher Education in Palestine has prepared many courses in information and communication technology for teachers including International Computer Driving Licence (ICDL). The ICDL course is important to promote teachers to a higher position and, in the near future, will be made compulsory for all teachers.

Palestinian trainee-teachers faced some difficulties during their learning sessions at NIT in ICDL course using conventional method. The trainee-teachers particularly those beginners lack of understanding in computer skills in the ICDL courses where LCD projector and text books are used during the training process.

Computer software training can be categorized as practical training; the best way to convey the computer skills is through a representation or a richer demonstration such as video (Berge & Hezewijk, 1999; Park, 1994). The trainees need to have clear and practical reference for the computer courses, or in other words, computer courses depend on the practice (AbuAtwan, 2008). Practical practices are essential for teaching and learning computer software, particularly textbooks are insufficient to help learners understanding the computer skills (Chan, 2009). The learners need opportunity to practice according to the procedures shown on

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computer screen. Moreover, an appropriate instructional tool is needed by the trainers to convey the learning content and demonstrate the skills to the learners (Yuen, 2004).

The instructors usually provide the learners with homework to solve and practice it individually at their own time, in order to improve their computer skills. Based on researcher's observation as the specialists and instructors, the learners need more assistance and follow-up once the lecture or the course is completed. The skill set of the learners is different, where most learners are capable to achieve only few percentages of the skills, while some fails to gain any skills. This shows that the learners need a better approach in order to help them understand the computer software. The conventional method fails to take into consideration the differences in aptitude and attitude of each participant. The training style (i.e. one-way instructor-centred style), in general, is not effective (Akahori & Nagai, 2001). Abu Atwan (2008) mentioned that one of the main important constraints in teachers training in Gaza Strip is the teaching methods and aids, as well as the absence of technology facilities in the training.

The continuous and increasing advancement of technology needs appropriate educational tools to keep the trainees abreast of all the innovations. One of these tools is video streaming. The lack of training involving computer courses can be effectively prevented if video streaming is used (Burnett, Maue, & McKaveney 2002).

Currently, video streaming is increasingly used in common technology. Instructors will be able to offer better online support and assistance, allowing their learners to have a better understanding of the concepts and approaches in learning process (Klass, 2003; Reed, 2003). Video streaming can be synchronously (live) or asynchronously delivered (delayed) and it allows learners to review the previous lectures and update the knowledge at their convenience. Learners using video streaming can view the lectures anytime, anywhere at their own paces, and as often as they wish. In other words, learners can learn efficaciously and contentedly with a flexible learning experience (Demetriadis & Pombortsis, 2007).

2. Video streaming and learning

Video streaming is a new instructional technology used to deliver audio and video presentations over the internet, allowing the content to play, or "stream," as it is being downloaded from the source (LCC, 2002).

Over the last decades, the use of video in education as a tool in assisting the teachers has become increasingly popular (Fevre, 2004). Moreover, video streaming will play a bigger role in delivering course content of e-learning to the learners (Hartsell, & Yuen, 2006).

Video streaming is a powerful tool in learning in which its usage is a general practice in all branches of education nowadays and has developed rapidly over the years (Fong et al, 2010; McGoverna et al., 2008; Shephard, 2003). Fong et al, (2010) and Shephard (2003) reports that the most of educational experts agree that video is better shown in short objects so as to maximise learners' concentration. It has the ability to attract learners' attention and present

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information which is easy to assimilate and can lead to a better description by the teachers (Koumi, 2006; Hartsell, & Yuen 2006; Shephard, 2003).The learners can reap the benefits of video streaming, assisting them to enhance the understanding and comprehension of difficult and complicated concepts and skills which are difficult to illustrate in simple graphics and text. By using the video streaming, the learner become engaged in the learning process, as well as to evoke the emotional reactions from the learners that can help them in increasing their motivation (Fong et al, 2010; Hartsell, & Yuen, 2006; Klass, 2003; White, Easton, & Anderson, 2000).

The asynchronous feature of video streaming in education allows the learners to attend class again by video and review the previous lectures and update notes at their convenience, own time, at their own speed, and can be repeated as often as needed (Patrick D, et al. 2009).

Winterbottom (2007) conducted a 2nd year environmental science module, where a series of 8 lectures were delivered via video streaming and podcasts. The finding and feedback from the learners were extremely positive. The main advantage is the flexibility and ability to repeat the lectures from the learners independently at the time most suited to them, rather than being constrained by lecture times, in addition to taking good notes and gaining better comprehension of the lecture materials. At the same time, the trainers guide and support them in a timely and professional way.

Winslow (2009) conducted a study to compare the effects of using static and video screen-captured of four treatment groups: static screen shot, video, video & narration and video & text to teach advanced PowerPoint skills to pre-service teachers at Coastal Carolina University in USA. The finding shows that the participants receiving video & narration group have performed significantly better than those in other groups, particularly those receiving video only.

Nicholson & Nicholson (2010) reported that the use of video streaming as a tool for teaching learners' skills in Microsoft Excel and Access (ICT literacy) has proved a positive effect on learning outcomes, in which video streaming provides the learners with course materials in the form of a greater satisfaction with education process, a greater understanding of the materials, in addition to the reduction in the amount of exertion needed to complete their homework and assignments.

Studies conducted by Nicholson & Nicholson (2010), Pachman & Ke (2009), Winslow (2007), Peterson & Elaine (2007) and Nickerson & Bryner (2002) have used video streaming, particularly screen capture, as helper agent to teach ICT literacy to learners. The result showed that video streaming is beneficial and effective as the learning outcomes of the learners improved.

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3. Redundancy and Multimedia Presentation

The use of multimedia presentations improves the learning outcomes (Mayer & Sims 1994). The multimedia presentation designers have to take into account how people learn and process the information (Mayer, 2001).
Clark &Mayer (2008) describe the redundancy in multimedia presentations as the graphics (e.g. video or animation) presenting the information to the learner using words in both on-screen text and audio narration. As a result, the redundant content obstructs the learning process.

Cognitive activities occur when a presentation consists of narration, video and synchronous related to on-screen text where the learner's cognitive system receives the narration through ears and is processed in the phonetic/verbal channel in the working memory (Figure 1). While the video received through the eyes is processed in the visual/pictorial channel in the working memory. At the same time, the on-screen text received by the learner is also through the eyes and must be processed in the visual/pictorial channel. The redundancy effect is related to the comprehension of the educational contents in solitude of each other (Sweller & Chandler, 1994).

The redundancy effect takes place when the additional information is presented to the learners (e.g. on-screen text in the narration video) and that the learners have to use their cognitive processing strength to read and construct the text with narration. This redundancy process contains incidental process which reduces the capability to engage in main learning processing (Tempelman-Kluit, 2006). This effect will be negative rather than positive or even neutral on the learning outcomes (Zheng, 2009). When the redundant information is excluded, the load on working memory is large reduced. As a result, the learning outcomes will be better. The visual and verbal materials contents are better when occurring simultaneously rather than sequentially (Mayer & Anderson, 1991; Mayer, & Sims 1994).

Clark & Mayer (2008) mention that "the adding redundant onscreen text to a multimedia presentation could overload the visual channel".

4. Research hypotheses

There is no significant difference among learners using Video cum Narration (VN) mode and learners using Video cum Text and Narration (VTN) mode on the post-test score (PTS).

5. Methodology

5.1 Participants

The participants of this study consisted of 205 elementary and secondary school teachers selected from Gaza schools, from all subjects, and of both genders (male and female). These

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teachers came to National Institute for Training (NIT), a branch institute of Ministry of Education and Higher Education (MOHE) in Palestine - Gaza.

5.2 Materials

The current study focused on learners achievement of the ICDL course. This course is essential for increasing teachers' ability to use computer in teaching and learning process as well as in their life. This course contained seven modules, as stated by ECDL Foundation (2007): 1 – Concepts of Information and Communication Technology (ICT), 2 – Using Computer and Managing Files, 3 – Word Processing, 4 – Spreadsheets, 5 – Using Databases, 6 – Presentation, 7- Web Browsing and Communication. The Ministry of Education in Palestine encouraged teachers to get an ICDL certificate and set this certificate requirement as a prerequisite for promotion.

This video streaming used to present and illustrate the ICDL skills and concepts by showing steps of any skills, one at a time, to the users. This study used two modes (video and narration) and (video and narration cum text). For example, to illustrate skill of how to insert tables in MS Word, the mouse moved to the insert menu, and concurrently on-screen text appeared on the bottom of the screen explaining what to do. At the same time, the narrative commentary illustrated this step, and both on-screen text and narrative commentary conveyed the same instruction. By presenting the information via video concurrently with on-screen text and narration, this treatment investigated the impact of the redundancy principle.

5.3 Design

The study utilized a quasi-experimental method to measure the effects of two different treatment modes (VN and VTN) on learners' achievement in (ICDL). The Independent Variable in this study were the modes of video presentation (Video cum Narration (VN) and Video cum Text and Narration (VTN)). The Dependent Variable is the Post-Test Scores (achievement).

5.4 Procedure

The trainees used video streaming on the given special website according to their group number. The instructional video streaming were divided into many parts, each one contains one skill. Before the trainer demonstrated the skills (mostly the skills are new for them), the trainees took the pre-test to determine their prior knowledge. After completing the pre-test, the lesson started, whereby trainees interacted with the video demonstrating the to-be-learnt skills. The trainer gave them enough and fair time according to the video duration (mostly between 1.5 to 4 min.). Finally, after watching the video, the trainees took the corresponding post-test. The result was recorded in Spreadsheet (Excel) for further statistical analysis. The total duration for the full course was 10 weeks, 2 hours per day. The treatment video objects were conducted separately according to the module the learners learn.

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6. Result

The statistical results indicated that the learners using the video cum narration (VN) mode attained significantly higher post-test scores than learners using video cum text and narration (VTN) mode. The probability level of 0.05 was used to test statistical significance. An ANCOVA procedure was carried out to determine whether this difference is significant of the two groups of learners. The results showed that there was a significant difference found in the achievement of learners between the VN and VTN groups, $F(1, 200) = 64.74$, $p = 0.000$.

A follow-up post-hoc pairwise comparison via LSD procedure was conducted to further determine where the significant differences in the mean had resided.

Table 3 showed the summary of the post hoc pairwise comparisons result. It can be seen that the mean difference found in the achievement of learners between the VN group and the VTN group was significant with $p = 0.000$. The VN group attained significantly higher post-test mean score (mean = 88.05) than that of the VTN group (mean = 72.8).

7. Discussion and Conclusion

The result indicates that redundant on-screen text overloads learners' cognitive system and so learning is inhibited. These results concurred with many studies in the literature (e.g., Aldalalah, 2010; Clark & Mayer, 2003; Diao & Sweller, 2007; Hii, 2012; Kelyunga, Chandler & Sweller, 1998; Mayer & Moreno, 2002; Pachman & Ke, 2009; Tempelman-Kluit, 2006; Zheng, 2009).
The results can be explained by cognitive load theory (Sweller, 1999) and redundancy principle proposed by Clark and Mayer (2008).

In multimedia learning, redundancy occurs when the same information is presented in different forms simultaneously. The redundant information may negatively affect learning outcomes (Clark & Mayer, 2008) and this is supported by the lower achievement of the VTN group found in this study. The VTN mode presents videos accompanying with both on-screen text and narration. Learners seemingly invest more cognitive resources to compare and integrate the on-screen texts with the verbal words while viewing the videos presented in the VTN mode (Mayer, 2005; Mayer & Moreno, 2003). Consequently, there may not be sufficient cognitive resources available for learners to engage in the learning task at hand (Tempelman-Kluit, 2006).

Another plausible explanation for the lower achievement of the VTN group is that learners may experience cognitive overload in their visual channel, thus impairing their ability to process incoming information. When viewing the VTN mode, the narrated words are registered at learners' ears and are then processed in the phonetic/verbal channel; while both the videos and the on-screen text are registered at learners' eyes and are then processed in the visual/pictorial channel. It can be clearly seen that the VTN mode can overload the visual channel. As a result, learners in the VTN group may fail to select the relevant information and to organize them into a coherent mental model.

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The VT and VTN mode presented on-screen text and videos simultaneously. Learners are required to split their visual attention between the two sources of visual information – videos and on-screen text. While viewing the video, learners may not be able to fully attend to the on-screen text. Apparently, learners have to expend more mental effort and visual attention on the learning task. However, learners' visual channel has only limited capacity for processing both video and on-screen text. The added on-screen text compete with the video for cognitive resources in the visual channel, thus inhibiting learning.

Zheng (2009) suggested that the learning outcomes can be improved by removing the redundant information (i.e., the on-screen text). Likewise, Clark & Mayer (2008) forecasted that meaningful learning occurs if the redundant on-screen text is avoided rather than included. The redundancy principle claimed that learners learn better and more deeply from graphic and narration than from graphic, narration and on-screen text. This is supported by the significant outperformance of the VN group over the VTN group in the study. In the VN mode, the removal of the redundant on-screen text seemingly increases the cognitive capacity for information process, resulting in better learning.

Additionally, learners in the VTN group are required to split their visual attention between the two different sources of textual information – on-screen text and its equivalent narrated words that are presented simultaneously. According to Kalyuga (2009), the learners may fail to select relevant on-screen text and narrated words concurrently and so learning is hindered.

Furthermore, Sweller's (1999) cognitive load theory assumed that if graphics and narration are appropriate and sufficient to convey information to learners, the wordiness becomes redundant as it may require extraneous processing in working memory. When viewing the VTN mode, learners had to process both the narrated words and its equivalent on-screen text. This eventually creates an extraneous cognitive load on learners' working memory, leaving insufficient cognitive resources for deeper processing of organizing and integrating (Mayer, 2001). With a high extraneous cognitive, meaningful learning will not take place (Chandler & Sweller, 1992). A significantly higher achievement of the VN group over the VTN group supported this claim.

Learners in the VTN mode are more likely to experience difficulty in learning while trying to process three sources of information – videos, narration and on-screen text at the same time. Learners use their visual channel to process both the videos and on-screen text and their auditory channel to process the narration. At the same time, they have to split their visual attention between the two visual information sources – videos and on-screen text (Mayer, 2008). A consequence, learning be inhibited.

In contrast, learners in the VN group process videos and narration in their visual and auditory channels, respectively, without overloading any of them. Hence, they have sufficient resources to engage in the cognitive process of selecting-organizing-integrating.

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Table 1 Mean and Std. Deviation of Post-Test Scores of (VN & VTN)

Group	Number	Mean	Std. Deviation
VN	100	88.05	17.9
VTN	103	72.8	17.8
Total	203	80.4	17.84

Table 2 ANCOVA of the Post-Test Scores of Learners Using Different Modes of Video (VN, VTN)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	16097.419a	2	8048.709	39.600	.000
Intercept	493033.758	1	493033.758	2.426E3	.000
treatment	13157.789	1	13157.789	64.736	.000
pre	2839.372	1	2839.372	13.970	.000
Error	40650.473	200	203.252		
Total	1381674.000	203			
Corrected Total	56747.892	202			

a. R Squared = .284 (Adjusted R Squared = .277)

Table 3 Summary of the Post Hoc Pairwise Comparisons

(I) Treatment	(J) Treatment	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
VN	VTN	*16.104	2.002	.000	12.157	20.051
VTN	VN	-*16.104	2.002	.000	-20.051	-12.157

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

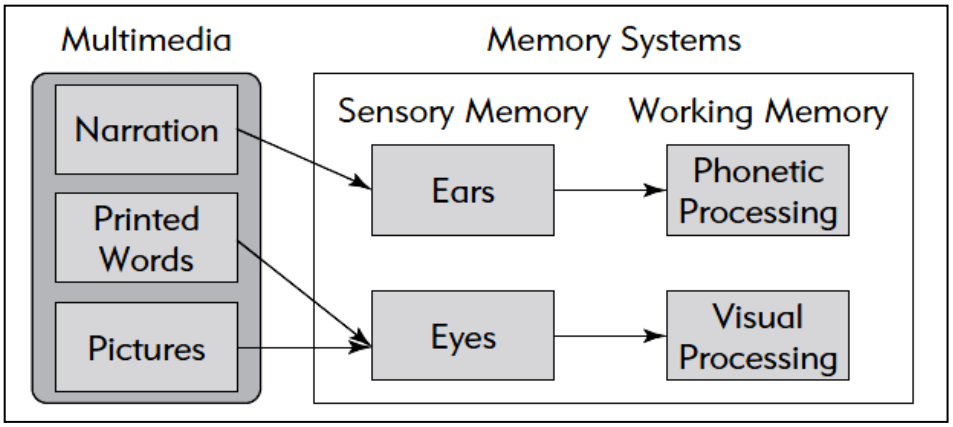

Figure 1 Redundancy Principle (Clark & Mayer, 2008)