

**EFFECTS OF REDUNDANCY AND MODALITY PRINCIPLES IN
VIDEO - STREAMING ON ATTITUDE AND ACHIEVEMENT**

BY

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Thesis submitted in fulfilment of the requirements

for the degree of

Doctor of Philosophy

July 2013

ACKNOWLEDGMENT

In the name of Allah, Most Gracious, Most Merciful

There is no words can describe my gratitude to Allah Almighty who endues me for enabling me to complete my PhD thesis.

I would like to express my gratitude to all individuals who have contributed and helped me in completing this doctoral thesis study by giving their opinion, guidance, advice, suggestion or advice. First and foremost, my grateful and heartfelt thanks go to my main supervisor Professor Fong Soon Fook, for his encouragement, expertise, and support that he has provided along the way to complete this work. Thanks him for being available to assist, provide perseverance and guidance and for his warm personality. My thanks and appreciation also goes to my co-supervisor, Associate Prof. Dr. Balakrishnan Muniandy for his invaluable and motivation assistance.

Special thanks to the Dean Professor Dr. Abdul Rashid Mohamed, the Deputy Dean, Associate Professor Dr. Hazri Jamil, and the faculty and administrative staff of the School of Education, USM for providing facilities, advice and support. I would like to gratefully acknowledge the principals, the National Institute for Training staff, and trainees teachers in NIT which served as the research sites: Schools of West Gaza Directorate.

My profound gratitude goes to the Palestinian Ministry of Education, National Institute for Training, and West Gaza Directorate for their assistance.

I also wish to record my deep appreciation to Ms. Lily Pei Lin Lee for the detailed proof-reading of this thesis.

I am grateful to my father and mother, my wife, my children, my family and my friends for their unfailing love, continues encouragement, sacrifice, prayers and confidence throughout the last period.

Ali Hassan AbuSaada

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KESAN PRINSIP MODALITY DAN REDUNDANCY DALAM VIDEO STREAMING TERHADAP SIKAP DAN PENCAPAIAN

ABSTRAK

Penyelidikan ini mengkaji kesan prinsip *modality* dan *redundancy* terhadap pencapaian dan sikap di kalangan guru dalam-perkhidmatan yang berlainan jantina, kemahiran computer and pengalaman di Gaza. Suatu reka bentuk eksperimen kuasi dengan factorial “3x3” dan “3x2” telah digunakan dalam penyelidikan ini. Pembolehubah bebas terdiri daripada tiga mod video streaming bagi suatu kursus ICDL, iaitu Video dengan Narasi (VN), Video dengan Text (VT), Video dengan Text dan Narasi (VTN). Pembolehubah moderator adalah jantina yang berbeza, kemahiran komputer dan pengalaman guru dalam-perkhidmatan. Pembolehubah bersandar adalah pencapaian (seperti yang diukur oleh skor pasca-ujian) dan sikap (seperti yang diukur oleh soal selidik sikap). Sampel kajian terdiri daripada guru dalam-perkhidmatan dari National Institute for Training di Gaza. ANCOVA telah digunakan untuk menentukan perbezaan signifikan di antara skor ujian pasca di kalangan ketiga-tiga kumpulan rawatan. Analisis kovarians (ANCOVA) telah dijalankan untuk mengkaji kesan utama serta kesan interaksi yang disebabkan oleh pembolehubah bebas terhadap pembolehubah bersandar. Hasil kajian menunjukkan bahawa guru yang menggunakan mod VN mempunyai prestasi lebih baik secara signifikan daripada guru yang menggunakan mod VT dan mod VTN. Tiada perbezaan yang signifikan dalam ujian pasca skor di kalangan pelajar lelaki dan perempuan. Mod VN didapati meningkatkan pencapaian dan sikap di kalangan guru berkemahiran computer yang rendah, guru senior dan guru perempuan berbanding dengan mod VT dan VTN. Secara kesimpulannya, kajian ini menyokong nilai positif dan keunggulan mod VN. Prinsip

modality dan *redundancy* patut dipertimbangkan dalam reka bentuk dan pembangunan video streaming bagi meningkatkan pembelajaran.

EFFECTS OF REDUNDANCY AND MODALITY PRINCIPLES IN VIDEO - STREAMING ON ATTITUDE AND ACHIEVEMENT

ABSTRACT

This study investigated the effects of modality and redundancy principles on the achievement and attitude among in-service teachers of different gender, computer skills and experience in Gaza. A “3x3” and “3x2” quasi experimental factorial design were adopted in this study. The independent variable was the three modes of video streaming on an ICDL course namely Video cum Narration (VN), Video cum Text (VT), Video cum Text and Narration (VTN). The moderator variables were the different gender, computer skills and experience of the in-service teachers. The dependent variables were the achievement (as measured by the post-test scores) and attitudes (as measured by attitudes questionnaire). The study sample consisted of 305 in-service teachers in the National Institute for Training in Gaza. ANCOVA was used to determine the significant differences in the post-test scores among the three treatment groups. Analyses of covariance (ANCOVA) were carried out to examine the main effects as well as the interaction effects of the independent variables on the dependent variables. The results showed that the teachers using the VN mode performed significantly better than learners using the VT mode and the VTN mode. There was no significant difference in post-test scores among male and female teachers. The VN mode was found to improve achievement and attitudes among learners with low computer skills, senior teachers and female teachers, as compared with the VT and VTN modes. In conclusion, the study supported the positive value and superiority of the VN mode. The modality and redundancy principles should be taken into consideration in the design and development of the video streaming lessons in order to improve learning.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

Technology has become part of our daily life over the past three decades, leading some researchers to discuss new formulation of the definition of literacy. Literacy is no longer limited to the literate in reading and writing. This is because technology has implicitly become a vital part in educational process and so computers are widely utilized in various educational institutions to cover large areas of uses. Therefore, this device has become an urgent need in preparing teachers either before or during the service in response to the development in the computerization of education.

Since the use of computer in education represents the practical side of information technology, teachers' knowledge, skills, and strong positive trend towards computer are required in promoting teachers with competent performance and enhancing the educational process outcomes.

Educational quality often depends on teachers' professional qualifications, therefore the foundation in teaching profession nowadays does not only end with the preparation of training of in-service teachers as it has to be continuous and extended to further levels (Chen, Huang & Shih, 2002).

In-service teachers need training opportunities in order to be informed of and engaged with new knowledge and evidence-based practices. This is one of several ways to generate the state-of-the-art information and skills among teachers (Horrocks, 2010). For education college students in university, the practical training period in schools is not sufficient to put them in their professional standing and right. Thus, in order to complete parts of this process, it is important for in-service training to upgrade the performance of teachers to achieve the objectives before and during the service (Abu Atwan, 2008).

Therefore, professional competency, academically and educationally qualification are of the utmost important in educational learning process for the teacher, the ministries of education through their educational systems, give great interest to improve and develop the performance and development of teachers profession.

The education policy in Palestine adheres to the linkage between educational and economic and social development requirements. Therefore, in raising the economic and social developments, the policy raises the educational level and the literate teachers to active agents by enhancing their performance and increasing their production, as well as the training process for in-service teachers through the reviving needs of the community in Palestinian economy, social and culture (Atwi, 2001).

Since its establishment in 1994, and during the period of 1994-2005, The Ministry of Education and Higher Education (MOHE) of Palestine has produced

more than 38,000 teachers trained from various specializations. Numerous courses for headmasters and supervisors have been conducted in order to change and develop the concepts of educational methods. These courses are to provide teachers and students with new skills in corresponding to age and cognitive and technology developments, benefiting more than a million students in Palestine (Palestinian achievements in education sector, 2005).

The Ministry adopts strategies for training teachers according to students' form levels needs – (1-4), (5-7), (8-10) and (11-12). The aims and goals of in-service training programs adopted by the Ministry of Education are to improve the quality of education as follows (The Ministry of Education, 2007):

1. To improve teachers' competency in teaching methods and specialization in curriculum contents for Palestinians.
2. To facilitate teachers to deal with crisis and emergency circumstances.
3. To acquire life skills for teachers in dealing with computer and information technology (IT).
4. To provide teachers with methods of preparing examination questions and conducting assessments and diagnosis.

The Ministry of Education and Higher Education (2006) summarized the types of training programs for in-service teachers in Palestine as follows:

1. Preparation for new teachers program.
2. New Curriculum program.
3. Teachers Orientation program.
4. Revitalizing program.

5. School unit training program.
6. Special courses.
7. Administrative training program.
8. Innovation program.
9. Computer and teaching methods.
10. Experimental program.
11. Preparation for leaders program.

In 2004, National Institute for Training (NIT) was established in accordance with the Ministry of Education's plan and vision. The NIT aims at raising the quality in human resources development in the Ministry of Education, in which all teachers training matters have been entrusted to this institute to develop teachers' occupational and technical levels (Ministry of Education and Higher Education, 2006).

The National Institute for Training NIT has chosen Information and Communication Technology (ICT) as its main objective, whereby computer laboratories are set up to implement courses in different ICT fields, as well as to form a special department of information technology to upgrade computer skills among teachers (The Ministry of Education, 2007).

In the NIT strategy plan (2007-2011), the main goals of NIT with respect to ICT are:

1. To abolish illiteracy in computer technology among all employees in the Ministry of Education, including teachers.

2. To identify computer competency that makes up minimum knowledge of the employees.
3. To determine computer skills for each job category in the Ministry.
4. To establish computer laboratories in all schools.
5. To design training programs in the field of Information and Communication Technology.
6. To apply modern technologies in training process.

UNESCO (2005) reported that ICT must be integrated in most learning activities and it should be as obtainable as pen and paper. In this context, the NIT looks forward to the extensive reliance on information technology in implementing the training programs, training of meetings as well as in providing training materials via electronic tools, and offering electronic services through the institute website. The NIT suggested the ICDL course as a main part of ICT literacy for all employees in the Ministry of Education (Ministry of Education and Higher Education, 2006).

Information and Communication Technology offer huge opportunity for the dissemination and development of knowledge with more effective education services. ICT should be incorporated with more traditional technologies and be more widely applied to the teachers training to be effective, particularly in developing countries (UNESCO, 2005).

Professional development in ICT plays a main role in assisting teachers to run through new technologies in learning and teaching (Teacher Training Agency, 2002).

Thus, most of teachers' professional development is considered as a key to consolidate technology in learning process (Karagiorgi & Charalambous, 2006).

The prevailing method of leading learning by teachers at NIT is mainly through the use of overhead projector (OHP) and LCD projector (Ministry of Education and Higher Education, 2006). In other words, e-learning is not implemented in the teachers training process. This mode of training is helpful, but not efficient for all training types, thus the ICT literacy needs a large scope and upscale illustration (Park, 1994).

Abu Atwan (2008) reported that one of the main barriers to effective training process in Gaza is that e-Learning has not been incorporated to support and help the teachers to understand and reach the information easier during and even after the training process. Thus, it is apparent that the current method of ICT literacy training for teachers is less effective and inefficient to fully achieve the teachers' understanding.

Chan (2009) reported that, practical way plays an essential role in the whole process of computer software courses. The demonstration of computer skills through the conventional way is not sufficient in teaching computer courses.

According to Itmezi (2007), e-learning tools can be used to support and assist the training process by providing educational materials over the internet to reduce the number of training sessions up to 24%.

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).

Nicholson & Nicholson (2010) reported that the use of video streaming as a tool for teaching students' skills in Microsoft Excel and Access (ICT literacy) has proved a positive effect on learning outcomes, in which video streaming provides the students 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.

Therefore, this research will investigate the effects of video streaming using three modes of presentation – Video cum Narration (VN), Video cum Text (VT), Video cum Text and Narration (VTN) among in-service teachers of different variables – gender, experience and computer skills, in ICDL courses on the achievement and attitude towards video streaming.

1.2 PROBLEM STATEMENT

Rapid changes in Palestinian society, in all fields, particularly in technology and methods of education and training, urges the educational supervisors working at the Ministry of Education and Higher Education of Palestine to keep pace with these developments as well as to prepare to integrate technology into training and education (Itmezi, 2007).

In the 21st century, the use of information and communication technologies (ICT) among teachers has significant role in education process (Hinostroza, 2008). Teachers without the training of ICT courses may not have sufficient knowledge of ICT literacy (Gordon, 2007). In addition, teachers need to be able to obtain fast and trustable technical consultation in their daily use of the technology (UNESCO, 2005).

Therefore, the National Institute for Training at the Ministry of Education and Higher Education in Palestine has accomplished several courses in information and communication technology for teachers including International Computer Driving Licence (ICDL). The ICDL course is presently important to promote teachers to a higher position and, in the near future, will be compulsory for all the teachers as part of ICT literacy.

The problem to be investigated in this study is the difficulties faced by the teachers during their learning sessions at NIT in ICDL course using conventional method. From the researcher's observations as well as based on his experience in teaching computer courses and as the head of information technology department at National Institute for Training (NIT) in MOHE, Palestine, the in-service 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 and the best way to convey the computer skills is through a representation or a richer demonstration (Berge & Hezewijk, 1999; Park, 1994). The trainees need to have clear and practical reference for the courses, or in other words, computer courses depend on the practice (Abu Atwan, 2008). Practical practices are essential for teaching and learning computer software as textbooks are insufficient to help learners master the computer skills (Chan, 2009). That is, learners are given opportunity to practice according to the procedures shown on 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).

Nowadays, teachers are trained with ICDL courses within a period of two and a half months consisting of 6 hours per week (i.e., a total of 60 hours). The instructors usually provide the learners with homework to solve and practice it individually at their own time in order to improve their competency in ICDL skills. Based on researcher's observation and analysis 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 skill, while some fails to gain any skill. This shows that the learners need a better approach in order to help them understand and master the program. The conventional method fails to take into consideration the differences in aptitude and attitude of each learners. The training style (i.e. one-way instructor-centred style), in general, is not effective (Akahori & Masahiro, 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.

Other difficulty faced by the trainees is that the training duration is inadequate to explain all the materials content in detail and to answer all the questions or do any revision. The instructor is able to explain only two or three times, but to explicate all the skills comprehensively and repeatedly seems impossible, and there are constantly one or more students who have discouragement to impart or disclose their difficulties (UNESCO, 2005).

Mandinach & Cline (1992) have clearly pointed out that the capability of ICT trainers cannot be fully utilized within a short time strenuous training. Therefore, the

training period has to be increased. However, the lecture time is very limited that the trainer is not able to solve all the learners' performance problems, thus affecting the efficiency and the progress of learning (Chan, 2009), particularly among trainees with different skills.

According to Itmezi (2007), obstacles to the training in Ministry of Education in Palestine can be summarized as follows: weakness of financial funding, limited number of training sessions compared to number of ministry staff and difficulties of movement of trainers and teachers between West Bank and Gaza Strip as well as between the cities in West bank.

Training via web-based supportive system is an effective approach to improve teachers' skills and knowledge effectively, regardless of previous knowledge and skills (Akahori & Nagai, 2001). Kanter (2007) reported that captured video streaming can be powerful and excellent tool to help learners demonstrate their computer skills, and to illustrate technical concepts that can hardly explained via text book especially to non-technical people. The features in captured video streaming allow the learners to revise the lectures at their schools or home, to download and review the previous lectures, to update the notes at their own pace at convenient time and to repeat as many times as they wish (Patrick, et al., 2009).

With regard to computer software training, Pachman & Ke (2009) noticed that the use of screen-captured video tutorial including redundant principle (video, narration and text) in teaching computer software to college students decreases their understanding of conceptual knowledge and imposes higher mental effort. According

to Mayer (2001), the redundant text added to the working memory capacity will negatively affect in students learning. Diverse modes of redundancy can obstruct the learning process, and therefore it should be avoided (Mayer, 2001; Sweller, 1999).

After reviewing the obstacles in teachers training process, in which most of conventional teachers do not meet all the requirements of the training process, in addition to this type of training that needs practical explication, the researcher has rationally decided that the obstacles can be overcome or reduced by organizing a training through a captured video streaming which should be taken into account. This is possible by providing them with more presentations and multimedia environment, particularly captured video streaming as a supportive tool for computer courses.

For that reason, the study needs the implementation of the research on three different modes of educational video that deals with various aspects to study the effects of redundancy and modality principles, specifically:

- Video and Text (VT)
- Video and Narration (VN)
- Video and Text and Narration (VTN)

This study investigated the effects of different modes of video streaming on learners' achievement and their attitude towards learning using the presentations that they interacted with. For this purpose, the researcher developed three different modes of video streaming – Video cum Narration (VN), Video cum Text (VT), Video cum Text and Narration (VTN). The researcher also examined which modes of video streaming has more positive impact on promoting the ICDL concepts and skills

among learners with different gender, experience, and competency of computer skills.

1.3 RESEARCH OBJECTIVES

1. To design and develop a website based on captured video streaming, particularly Video cum Narration (VN), Video cum Text (VT), Video cum Text and Narration (VTN).
2. To study the effects of using Video cum Narration (VN), Video cum Text (VT), Video cum Text and Narration (VTN) modes on post-test score (PTS) between the learners.
3. To study the differences of post-test score (PTS) among male (M) and female (F) learners.
 - 3.1 To study the effects of Video cum Narration (VN), Video cum Text (VT), Video cum Text and Narration (VTN) modes on post-test score (PTS) among female (F) learners.
 - 3.2 To study the interaction effect among the treatment modes and gender on post-test score (PTS).
4. To study the differences of post-test score (PTS) among senior teachers (ST), intermediate teachers (IT) and junior teachers (JT).

- 4.1 To study the effects of Video cum Narration (VN), Video cum Text (VT), and Video cum Text and Narration (VTN) modes on post-test score (PTS) among senior teachers (ST).
- 4.2 To study the interaction effect among the treatment modes and teachers' experience period on post-test score (PTS).
5. To study the differences of post-test score (PTS) among learners with high computer skills (HCS), medium computer skills (MCS) and low computer skills (LCS).
 - 5.1 To study the effects of Video cum Narration (VN), Video cum Text (VT), and Video cum Text and Narration (VTN) modes on post-test score (PTS) among learners with low computer skills (LCS).
 - 5.2 To study the interaction effect among the treatment modes and computer skills on post-test score (PTS).
6. To measure the attitude of learners towards different modes of captured video streaming.

1.4 RESEARCH QUESTIONS

The research questions driving this study are as follows:

1. Will there be any significant difference among learners using three modes of video streaming Video cum Narration (VN), Video cum Text (VT) and Video cum Text and Narration (VTN) on the post-test score (PTS)?

2. Will there be any significant difference among male (M) learners compared to female (F) learners on the post-test score (PTS)?
 - 2.1 Will there be any significant difference among female using three modes of video streaming (VN, VT and VTN) on the post-test score (PTS)?

 - 2.2 Are there any interaction effects among the treatment modes and gender on the post-test score (PTS)?

3. Will there be any significant difference among junior learners (JL), intermediate learners (IL) and senior learners (SL) on the post-test score (PTS)?
 - 3.1 Will there be any significant difference among senior learners (SL) using three modes of video streaming (VN, VT and VTN) on the post-test score (PTS)?

- 3.2 Are there any interaction effects among the treatment modes and experience period on the post-test score (PTS).
4. Will there be any significant difference among learners with high computer skills (HCS), learners with medium computer skills (MCS) and learners with low computer skills (LCS) on the post-test score (PTS)?
 - 4.1 Will there be any significant difference among learners with low computer skills (LCS) using three modes of video streaming (VN, VT and VTN) on the post-test score (PTS)?
 - 4.2 Are there any interaction effects among the treatment modes and computer skills on the post-test score (PTS)?
5. Will there be any significant difference among learners using three modes of video streaming (VN, VT and VTN) on attitude score (AS)?

1.5 RESEARCH HYPOTHESES

Null hypotheses are used in this study; the probability level of 0.05 was used to test statistical significance:

- H₀ 1. There is no significant difference among learners using Video cum Narration (VN) mode and learners using Video cum Text (VT) modes on the post-test score (PTS).

- H₀ 2. There is no significant difference among learners using Video cum Text (VT) mode and learners using Video cum Text and Narration (VTN) mode on the post-test score (PTS).
- H₀ 3. 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).
- H₀ 4. There is no significant difference among Male (M) learners and Female (F) learners on the post-test score (PTS).
- H₀ 4.1 There is no significant difference among female using Video cum Narration (VN) mode and female using Video cum Text (VT) mode on the post-test score (PTS).
- H₀ 4.2 There is no significant difference among female using Video cum Text (VT) mode and female using Video cum Text and Narration (VTN) mode on the post-test score (PTS).
- H₀ 4.3 There is no significant difference among female using Video cum Narration (VN) mode and female using Video cum Text and Narration (VTN) mode on the post-test score (PTS).
- H₀ 4.4 There are no interaction effects among the treatment modes and gender on the post-test score (PTS).
- H₀ 5. There is no significant difference among junior learners (JL) and intermediate learners (IL) on post-test score (PTS).

- H₀ 6 There is no significant difference among intermediate learners (IL) and senior learners (SL) on the post-test score (PTS).
- H₀ 7 There is no significant difference among junior learners (JL) and senior learners (SL) on the post-test score (PTS).
- H₀ 7.1 There is no significant difference among senior learners (SL) using Video cum Narration (VN) mode and senior learners (SL) using Video cum Text (VT) mode on the post-test score (PTS).
- H₀ 7.2 There is no significant difference among senior learners (SL) using Video cum Text (VT) mode and senior learners (SL) using Video cum Text and Narration (VTN) mode on the post-test score (PTS).
- H₀ 7.3 There is no significant difference among senior learners (SL) using Video cum Narration (VN) mode and senior learners (SL) using Video cum Text and Narration (VTN) mode on the post-test score (PTS).
- H₀ 7.4 There are no interaction effects among the treatment modes and experience period on the post-test score (PTS).
- H₀ 8. There is no significant difference among learners with high computer skills (HCS) and learners with medium computer skills (MCS) on post-test score (PTS).

- H₀ 9. There is no significant difference among learners with medium computer skills (MCS) and learners with low computer skills (LCS) on the post-test score (PTS).
- H₀ 10. There is no significant difference among learners with high computer skills (HCS) and learners with low computer skills (LCS) on the post-test score (PTS).
- H₀ 10.1 There is no significant difference among learners with low computer skills (LCS) using Video cum Narration (VN) mode and learners with low computer skills (LCS) using Video cum Text (VT) mode on the post-test score (PTS).
- H₀ 10.2 There is no significant difference among learners with low computer skills (LCS) using Video cum Text (VT) mode and learners with low computer skills (LCS) using Video cum Text and Narration (VTN) mode on the post-test score (PTS).
- H₀ 10.3 There is no significant difference among learners with low computer skills (LCS) using Video cum Narration (VN) mode and learners with low computer skills (LCS) using Video cum Text and Narration (VTN) mode on the post-test score (PTS).
- H₀ 10.4 There are no interaction effects among the treatment modes and computer skills on the post-test score (PTS).

- H₀ 11. There is no significant difference among learners using Video cum Narration (VN) mode and learners using Video cum Text (VT) mode on attitude score (AS).
- H₀ 12. There is no significant difference among learners using Video cum Text (VT) mode and learners using Video cum Text and Narration (VTN) mode on attitude score (AS).
- H₀ 13. There is no significant difference among learners using video cum Narration (VN) mode and learners using Video cum Text and Narration (VTN) mode on attitude score (AS).

1.6 SIGNIFICANCE OF THE STUDY

This study is useful for the Ministry of Education and Higher Education and National Institute for Training in Gaza Strip. It attracts attention on e-learning, particularly the captured video streaming, in training the teachers. Besides, it helps them to understand the benefits, importance, and effects and be able to contribute to a meaningful learning experience despite some negative aspects of captured video streaming usage in ICT training at NIT. If the result can prove that the efficiency of captured video streaming give positive impact on the achievement and attitude, perhaps MOHE will use the same study on other subjects to train the in-service teachers. In this case, MOHE can design a special web-based system for students in all subjects. As a consequence, this study will offer great contributions in carrying out future research for in-service training teachers in Palestine.

This research is significant as it aims at acquiring better understanding of the relationship between redundancy and modality principles on teachers' achievement and attitude towards captured video streaming. This will help training materials designers and supervisors at MOHE to take into account the effects of redundancy and modality principles in the teaching process. Hence, to develop e-learning website based on captured video streaming, the best type of videos – Video and Narration, Video and Text, and Video, Text and Narration, are chosen depending on the study findings.

This study is useful in motivating the ICT instructors at NIT and lecturers in Palestine universities to adopt and apply e-learning in training process as well as to provide them with appropriate captured videos that will help them further explain computer software lessons.

Here, the researcher attempts to help teachers gain different teaching strategies and develop and improve their ICDL skills via online learning courses besides trying to overcome the difficulties faced by them when using conventional method. In addition, teachers can learn via online or download the captured video lessons at their convenience before or after attending the course at NIT, and assuredly by this way, it can reflect the teachers' performance and competencies.

Therefore, this research hopes to shed light on the significance of various implementations of the redundancy and modality principles through the captured video streaming and the contributions to improve ICDL skills achievement.

This study is important as it exceeds the conventional method and it attempts to offer the information in a new approach which can assist and enable the learners to deal with ICT literacy. Finally, this study focuses on in-service teachers' attitude towards the captured video streaming as well as their achievement in ICDL course.

1.7 THEORETICAL FRAMEWORK

The theories underlying this study are the Cognitive Theory of Multimedia Learning and Cognitive Load Theory.

1.7.1 Cognitive Theory of Multimedia Learning:

According to Mayer (2001), the multimedia learning is learning from both words and pictures. The words can be printed (e.g., on-screen text) or spoken (e.g., narration). The pictures can be static (e.g., graphs, illustrations, charts or photos) or dynamic (e.g., video, animation, or interactive illustrations) (Mayer & Moreno, 2003).

The rationale for cognitive theory of multimedia is that people learn more effectively from words and graphics rather than words alone. The words comprises printed words or narration; graphics comprises static graphics or dynamic graphics such as animation or video (Mayer, 2005).

When the multimedia is presented, the information processing system of human beings uses both words and pictures together rather than words alone. The design of multimedia environments should be compatible with how people learn

(Mayer, 2001). Cognitive model of multimedia learning in presenting human information processing system is stated by Mayer as displayed in Figure 1.2.

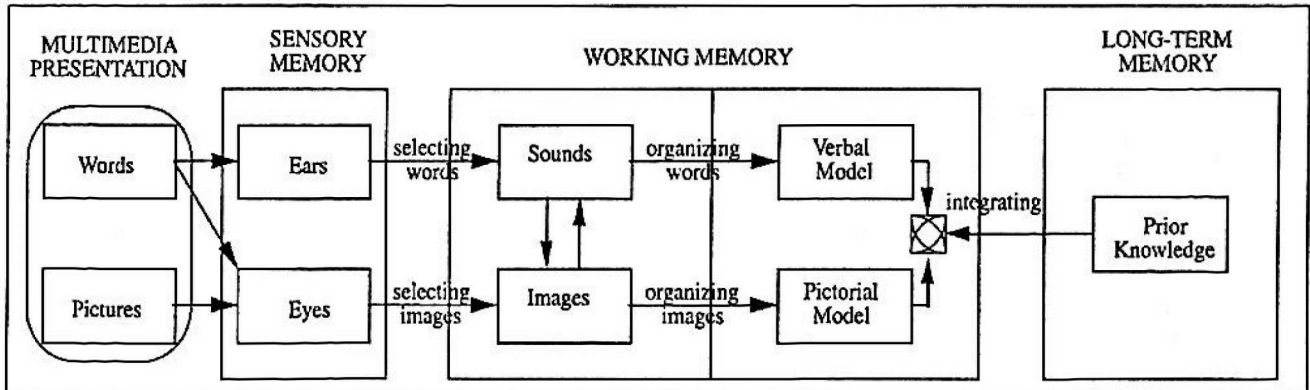


Figure 1.2 Cognitive Theory of Multimedia Learning (Mayer, 2001)

Figure 1.2 represents the theory as a series of boxes that is arranged into two rows and five columns, with arrows connecting them. The columns represent memory stores including sensor memory, working memory and long-term memory. The two rows represent the two information- processing channels, with the auditory/verbal channel on top and the visual/pictorial channel on the bottom.

The presented multimedia enters the learner’s sensory memory through the eyes and ears. The learner selects the relevant visual and auditory information from multimedia presentation. When the information is aurally presented, it enters the auditory channel via the ears; on the other hand, when the information is presented visually, it enters the auditory visually via the eyes and is processed through the visual channel. The sensor memory allows for the spoken words to be held as exact auditory memory for a brief time period in the auditory sensor memory and pictures and text to be held as exact visual images for brief time period in the visual sensor memory. The arrow from pictures to eyes represents pictures being registered at the

eyes; the arrow from words to ears represents spoken words being registered at the ears.

Long-term memory is the learner's storehouse of knowledge. Unlike working memory, long-term memory can hold large amount of knowledge over a long time period. In order for learners to recall and actively use the information being stored in long-term memory, the information must be transferred into working memory.

Active cognitive processing in multimedia learning requires five cognitive processes that are represented by labelled arrows: selecting words, selecting images, organizing words, organizing images, and integrating (Mayer & Moreno, 2003). Selection is a mental process where the learner pays attention to relevant information verbally or non-verbally presented to him. Mayer (1984) defines selection as choosing the right information and adding it to the working memory.

The central work of multimedia learning occurs in the working memory. According to Mayer (2001), "*the working memory is used for temporarily holding and manipulating knowledge in active consciousness.*" The learner will process the visual information in pictorial model while auditory information in verbal model in working memory, which is "*the centre of cognition*" (Clark & Mayer, 2003). In the working memory, the incoming information is stored as unprocessed information. Based on the visual and auditory sensory modalities, the learner organizes verbal and pictorial information into coherent mental representations. The selected words are organized into verbal model, while the selected pictures into pictorial model. Then, the corresponding information occurs among verbal and pictorial representations in

working memory at the same time. Finally, the learner makes the integration between the verbal and pictorial information and relevant prior knowledge from long-term memory. This newly integrated knowledge is continually stored in long-term memory, leading to meaningful learning (Dacosta, 2008; Lan, 2010). Hence, the meaningful learning occurs when the learner engages in all cognitive processes, that is learner must carry out each of these cognitive processes: selecting relevant words and images, organizing them into coherent verbal and visual representations, and integrating corresponding verbal and visual representations (Mayer & Moreno, 2002c). The construction of connection between verbal and visual representations is more likely for situations in which the learner can simultaneously hold corresponding visual and verbal representations in memory at the same time. Thus, instructional materials should be designed to maximize the chances for such crucial cognitive processing.

1.7.2 Cognitive Load Theory

According to Kalyuga (2009), Cognitive Load Theory describes how human cognitive architecture has implications for the design of instructions. The theory categorizes several different sources of cognitive load (e.g., intrinsic, extraneous, and germane load) that are associated with different instructional implications and cognitive load effects.

These sources and principles of cognitive load used to design and deliver instructional materials that enhance by utilizing the limited capacity of working memory and minimizing working memory overload (Pass, Renkl, & Sweller, 2003).