Effectiveness of Vocational Instruction with Reflection and Review on Mastery of Safety Knowledge and Skills

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Abstract: Vocational training among flight attendants is of critical importance because they take care of millions of passengers annually. But many studies and safety articles noted deficiencies of flight attendants in dealing successfully with emergencies due to inadequate vocational training. The researchers suggest that expertise among flight attendants can be enhanced through following the in-flight safety assurance model and based on Gagne' design model. Therefore, the researchers suggest that due to traditional training of flight attendants they will use vocational systematic interactive multimedia instruction with reflection and review to measure their effect on flight attendants' performance. The sample of the study included 70 flight attendants divided into two crews. One crew studied vocational systematic instruction with reflection and review and the other crew did not use reflection and review. Data was analyzed using ANCOVA. The findings showed that VSIMI + RR and the VSIMI methods were equally effective in improving mastery in the cabin vocational safety knowledge and skills and in enhancing vocational safety knowledge in the contexts of verbal information and intellectual skills but review and reflection activities conducted by the supervisors did not significantly contribute to the gain of the cabin vocational SKS among the flight attendants. These findings suggest the VSIMI with RR should be adopted for the training and maintenance of expertise of flight attendants. RR did not work as expected; so further research should be conducted. Gagnes' theory of hierarchical learning along with instructional systematic design (ISD) should be used for the rest of aircraft types and all the safety manual. In addition, this study used two domains out of the five domains of learning by Gagne. Future research should use all the five domains including psychomotor which could measure certain variables inside the aircraft or in mock facilities in the training center.

1. Introduction

Among the major vocational education and training issues is cabin safety assurance. Safety of passengers onboard is a major responsibility of flight attendants; therefore, flight attendants' vocational education and training is of critical importance (Lecouturier, 1999). Flight attendants' tasks onboard include safety knowledge and skills duties, such as administering first aid, fighting fires onboard and conducting the full procedure in case of planned emergency. Flight attendants did reveal high standard of vocational training when they successfully evacuated US Airways Flight 1549 which landed in the Hudson river. However, other studies and safety articles noted deficiencies of flight attendants in dealing successfully with emergencies due to inadequate vocational training (Bani Salameh et al, 2010a; Mahoney et al, 2008; Rosenkrans, 2006; FSF, 2003; Phillips, 1992). Moreover, Rhoden, Raltson and Ineson (2007) claimed that flight attendants' safety role lacks attention in the academic literature although they take care of the safety of millions of passengers and reporting of incidents involving flights is downplayed.

Vocational safety training among flight attendants is of critical importance so that they become able to perform their duties properly when an emergency situation arises onboard. Deficiencies in vocational training might pave the way for accidents and loss of human life.

Bani Salameh et al (2009) proposed that Expertise among flight attendants is a result of direct and indirect interactions among factors of ISA model and Bani Salameh (2010a) proposed that instructional systematic design (ISD) and the use of proper theory could enhance expertise schema among flight attendants within duty loop of ISA model (figure 1).

The traditional vocational safety training of enhancing flight attendants' expertise schema, followed within the duty loop of ISA model is just continually reading the flight attendant in-flight safety manual and rehearsing the emergency procedures in their minds, too often without adequate vocational training support except for the recurrent training.
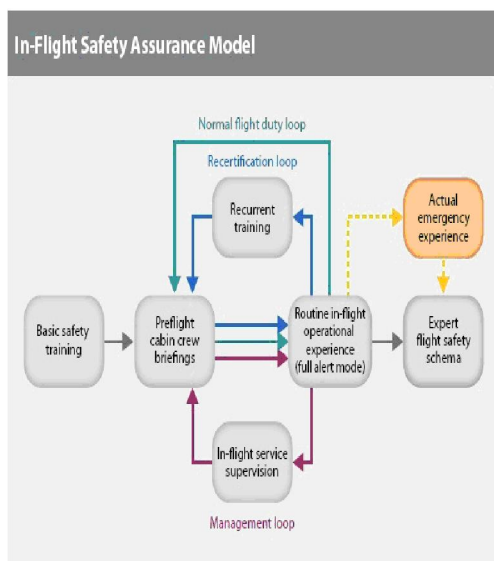
Figure 1: In-Flight Safety Assurance Model by Bani Salameh et al, 2010

The previous studies and safety articles suggested that although flight attendants were exposed to vocational training and annually recertified to perform the safety procedures, the vocational training and other activities that they underwent in the course of their careers were fragmented and focused on specific skills and behaviours, but not on the integration of vocational safety knowledge and skills (SKS), nor on the development of vocational expertise schema (Cited in Bani Salameh et al (2010a).

Thus, this study will use vocational systematic interactive multimedia training VSIMT with reflection and review to measure:
1- Overall performance and performance in planned emergency, firefighting and first aid situations.
2- Performance or mastery in discriminations, concepts, rules, higher order rules and verbal information.

2. Attributes of systematic instruction

In order to have effective vocational training, systematic approach should be adopted. Otherwise, vocational training will be fragmented and unsuccessful due to the lack of proper systematic instructional system (Hays, 1992). Despite the fact that creating interactive multimedia sources is available to everyone, designing good material should be based on proper criteria (Lowe, 2001; 1999). Instructional system design is the best method to design interactive multimedia (Johnson, 2009) and it proposes systematic procedures and interactive multimedia environments (Mahnaz, 2001).

Gagne et al (1992) point out that the design model must adapt with the current circumstances with regard to facilities, equipment and supplies.

According to Gagne et al (1992) lesson planning must go through the following steps: First, the objective of the lesson should be clarified, considering that some lessons might include more than one objective. Second, the events of instruction should be presented without necessarily referring to all the events in one lesson or to be presented in order. The third is choosing the media materials and activities that suit the objective. These materials can be used if available or new material is required. Dick and Carey (2001) model of systematic instructional design is used in this research which conforms to the system proposed by Gagne.

3. Attributes of Reflection and Review

Reflection refers to reviewing the subjects studied in order to enhance the practice in the field. Donaghy and Morss (2000) stress the need to conduct self-evaluation of rules to find justification to enhance clinical practice.

Nielsen, Stragnell and Jester (2007) conducted an assignment to enhance reflection among learners in nursing. They recommended the use of a guide during reflection because it enhances students prompts and improves the capability of decision making. The guide in this research is the reflection and review scripts which are in the form of Question and Answer (Q & A).

Boud (2001) referred to the merits of reflection as a means to motivate learners to question the content of the instruction. Thus they could make inferences and evaluations, which would help them enhance retention and interactivity.

Ericsson (2009) pointed out that warfare training includes review questions which were considered as supporting good training. The review questions included examples such as "What did you see? What were you thinking? What did you do? What could you have done differently?" Then the trainees would ask themselves without interference from the instructor.

In the context of cabin safety, Chute and Weiner (1995) state that introductions and briefings, which are similar to reflections, have the potential of setting high expectations, increase interactions, shed light on certain issues that might arise during the flight and provide a good opportunity to review certain emergency and security procedures in addition to giving the chance for providing better clarification.

Bartels (2008) refers to review and reflection as two ways for thinking about what is being learned and learn more about ourselves. He states that review can be achieved following a question, comment, directions or an activity. Thus the responder will process the information and make a

response. Sprenger (1999) on the other hand, notes that having reviews at intervals strengthens the long-term network. He adds that metacognition requires two stages. The first is knowledge about cognition or thinking about our thinking. The second is monitoring and regulating cognitive processes. Likewise, Devine (1993) and Jung (1992) identified metacognitive knowledge as knowledge about one's own cognition. Anderson and Krathwohl (2001), Conner (2002) and Hertzog (2002) argue that metacognitive knowledge involves, among other things, knowledge about self-regulation of one's own learning. From the previously mentioned definitions, metacognition can be defined as the conscious awareness of one's own cognition and the conscious control of one's own learning.

Cognitive structures, which are necessary for learning activities, are enhanced through reflection. Therefore, reflection is the link between metacognitive knowledge and metacognitive control which leads to problem solving (Ertmer & Newby, 1996).

4.Background

FSF Editorial Staff (2005) referred to a report by the captain on Boeing 757 when the supervisor committed a mistake by opening the door without taking permission from the captain. The captain said that someone could have been killed in the incident. The editorial staff also reported another incident when a flight attendant inadvertently deployed the slide raft in 2004 aboard A320. Other reports and studies pointed that flight attendant safety training has been suffering adequate attention (Rhoden et al, 2007; Mahony et al, 2008, Rosenkrans, 2006, FSF, 2005 and Phillips, 1996).

Mahoney et al (2008) reported lack of vocational training among flight attendants in administering first aid due to the types of instructional techniques employed, variations in program delivery and the time interval between vocational training and re-assessment and lapses in knowledge and skill retention. Mahony et al recommended that frequent brief skill reviews be used through training technologies to improve retention of skills and this can be done before pre-flight briefing and the frequency of refresher course should be less than 12 calendar months.

Earlier, Phillips (1992) referred to a report by the National Transportation Safety Board (NTSB) which deals with investigation of 24 accidents. The report sheds light on the fact that flight attendants did not always follow emergency procedures, had difficulty locating and operating emergency equipment and sometimes failed to perform their safety duties in accordance with established criteria. Cushman (1992) in "Flight-Attendant Training on

Safety is Faulted" pointed out that the National Transportation Safety Board (NTSB) reported that airlines are not adequately training flight attendants to handle emergencies such as evacuation. It is mentioned that the association of flight attendants added that it has long urged airlines to provide more thorough vocational training.

Chute and Wiener (1996) refer to cabin cockpit communication as crucial to the safety of the aircraft and its occupants. They give example of the crash of Air Ontario F-28 on takeoff where 24 people were killed because of the accumulation of ice on the wings. Flight attendant Sonia did not communicate with the cockpit because she thought that the cockpit are professional enough to deal with such issues. Chute points out that flight attendants do not communicate because of reasons like cultural directives, past experience and ambiguity of aviation rules. On the other hand, Bani Salameh et al (2010) explains the lack of proper communication on the part of flights attendants as due to different joint cognitive systems between cockpit and the cabin whereby flight attendants do not develop vocational expertise safety schema because of inadequate vocational training.

Still, the example of the heroic role by the flight attendants in the accident of the Hudson River, where US aircraft ditched into the Hudson River, reveals yet a positive picture of the flight attendants training. Leocha (2009) in "Unsung Heroes on the Hudson - Flight Attendants on US Airways 1549" points out that the actions of the flight attendants in the cabin were the key factor in the successful evacuation of the floating plane. Though there are reports of heroic acts and professional performance by the flight attendants in emergency situations, the previously mentioned studies continue to show weaknesses/lapses in actual abilities.

5.Problem Statement

Vocational training is important for the flight attendants onboard as it requires errorless vocational safety behavior. Training flight attendants is based on the flight attendant in-flight safety manual which is the only reference used in the duty loop of ISA model. It is a text-based manual provided in a form of documentation. Moreover, the safety knowledge and skills for a given topic in the safety manual are presented in different and separate sections which pose the shortcoming of fragmentation. For example, it provides safety knowledge as specific information of the aircraft in one chapter or section and provides emergency procedures in another chapter or section (Libyan Airlines Flight Attendant In-Flight Safety Manual, 2007). Therefore, when a flight attendant needs to study planned emergency, for example, he has to

refer to emergency procedures section to acquire the procedure. He also needs to move to the section of specific information of aircraft to recall the specific pieces of knowledge that are needed to perform the procedure.

Thus, in this study the vocational tasks that the flight attendants have to perform are now defined in terms of Gagne's terminology (Bani Salameh, 2010), i.e., consisting of verbal information and intellectual skills such as discrimination, concepts, rules, problem solving and higher-order rules (Gagne, 1992). For example, in Planned Emergency, flight attendants must be able to identify the verbal information such as the visual and aural signs that represent declaration of emergency. As for intellectual skills hierarch. With regard to discrimination, flight attendants should be able to discriminate the planned emergency call from sterile cockpit call. Flight attendants must also identify the concepts of "Bend over; Stay Down". As for rules the flight attendants must also be able to demonstrate going to their stations to listen to the conference call from the supervisor. Finally, higher order rules in this research are represented through the ability of the flight attendants to make connection between more than one rule or concept to solve a problem.

Thus, the research objectives in this research can be summarized as mastery of vocational safety knowledge and skills among flight attendants. Second, it aims at enhancing flight attendants vocational safety knowledge and skills that are identified in terms of Gagne's domains of learning particularly verbal information and intellectual skills and following the Dick and Carey's model of systematic instructional design (SID). This could help flight attendants to develop and retain vocational experts' memory of SKS before Pre-flight Briefing (PFB).

The use of vocational systematic interactive multimedia instruction (VSIMI) delivered through computer-based training (CBT) might increase mastery of vocational safety knowledge and skills (SKS) and safety assurance with minimal effort and investment of time and money. The use of training can be extended into handheld devices to be carried onboard to be reviewed after service and when needed to prevent decay of vocational safety knowledge and skills and can reduce the need for providing other refresher vocational training courses for flight attendants at short intervals.

6. Research Limitations

The package was developed with reference to Airbus 320 aircraft but because the procedures are applicable to all aircrafts, the findings of the research can be generalized to all airlines.

7. Methods

The population of the study consisted of 600 flight attendants working in Royal Jordanian airline in 2012. All the cabin attendants are above eighteen years of age and they have passed through the same vocational training and safety courses related to safety onboard. All the flight attendants have the basic knowledge of using the computers since there are eight computers provided in the crew centre for the flight attendants use and using computers is part of their job.

The sample of the study consisted of 70 flight attendants and supervisors in ten crews chosen randomly by the scheduling department with each treatment group comprising 35 subjects. Cohen, Manion and Morrison (2005) recommend that the lowest number in each group should be a minimum of 30. And Gay (1996) recommends a minimum of 30 subjects per group to verify the existence or non-existence of a relationship. All the flight attendants have equal and independent chance of being selected as members of the sample (Gay, 2003).

Each crew included 6 flight attendants and one supervisor. The age range of the flight attendants is 19-55 years. These flight attendants have undergone through the same vocational training and refresher courses. They have basic knowledge of using the computers. Data collection procedures were implemented with normal flight duty routines with as little disruption or interference as possible.

7.1 Research Design

The subjects of the study consisted of two groups. One group studied the VSIMI and the second group studies VSIMI with Reflection and Review (RR). Each group comprises 35 flight attendants. The study is quasi experimental. The independent variables are the VSIMI and VSIMI & RR. The dependant variables are (i) overall performance and performance in (a) planned emergency, (b) fire fighting and (c) first aid situations, (ii) performance or mastery in (a) discriminations, (b) concepts, (c) rules, (d) higher order rules and (e) verbal information.

The pre-test scores will be used as a covariate because it is not assumed that the flight attendants are homogeneous in their abilities.

7.2 Instructional method and duration for the two groups

The first group studied the VSIMI through the computers provided at the crew centre followed by discussion of RR during Pre-flight Briefing (PFB). The Second group studied the VSIMI without RR and did discussion of safety knowledge during PFB in the traditional manner. As and following such only one crew was in the crew lounge to study the lessons at any given time. The crews of the treatment groups did not come into contact with each other due to the

technical nature of the flights. They went through the instructional package for about 20 minutes and then attended the PFB before proceeding to operate their assigned flight. The exposure to the instructional package lasted for two months to complete all the lessons.

All flight attendants participating in the study sat for the pre-test three weeks before the start of the study.

7.3 Description of the Content of the Vocational Systematic Interactive Multimedia Instruction

The researcher chose three main lessons to be the content of the systematic interactive multimedia instruction. The first lesson is planned emergency. This lesson is chosen because it includes all the steps necessary to conduct a detailed procedure especially when there might be impending emergency landing either on land or in water (Ditching). The lesson of planned emergency includes all the steps required to be performed in unplanned emergency. Therefore, this lesson covers a wide range of capabilities necessary for the flight attendants incase of emergency that have to do with coordination and communication (Flight Safety Foundation, 2003). The second lesson includes fire fighting capability which is very important since many fatalities occurred in flight because of flight attendants failure to extinguish fire properly and failure to conduct the appropriate procedure for in-flight safety (Roseknrans, 2006). The third lesson includes first aid lesson of three parts, fainting, unconsciousness and burns. These three subtopics are important because the researcher, through his experience as a flight attendant for thirteen years, had witnessed many cases that involved first aid capability in-flight with regard to fainting, unconsciousness and first degree burns. In addition, Mahoney et al (2008) referred to flight attendants deficiencies in first aid situations.

7.4 Design and Development of the Systematic Interactive Multimedia Instruction

Gagne's nine events of instruction were adopted as a procedure in designing the individual clusters of the instructional lessons. The nine events of instruction were used in designing the software. Dick and Carey model of systematic instructional design was used in the design, development, implementation and evaluation of the instruction because of its robustness and an emphasis on formative and summative evaluation.

7.5 Instructional Materials

The instructional material included the instructional package itself and the reflection and review scripts. The package included the three lessons of planned emergency, fire*fighting* and first aid situations and the reflections and review scripts refer to the scripts (Q & A) that covered the individual modules of the lessons in the instructional package. Reflection and review is set of scripted Q & A sessions involving recall, comprehension, elaboration, analysis and assessment of the main points of the lessons led by the in-flight supervisor during PFB.

7.6 Instructional Activities

The instructional activities in the systematic interactive multimedia instruction followed Gagne's events of instruction particularly the sixth event of eliciting performance through interactive questions and the seventh event of providing the flight attendant with informative feedback to build reinforcement.

7.7 Duration of Each Session of Instruction

The actual duration of the program lasted for two month which covered the eleven SIMI modules. Each session lasted for twenty minutes before the crew started their PFB time. This made a course time of three hours and forty minutes. The progress of the course was pre-set according to the number of sub-topics in each session.

7.8 Procedures of Data Collection: Validity of the Instruction

The lessons were validated at two levels. First, 6 managers who are subject matter experts from Royal Jordanian in-flight services validated the content of the VSIMI package. Second, specialist in educational technology reviewed the program. Amendments were done accordingly.

7.9 Procedure of the Program

The cabin safety vocational training program was installed on the computers provided in the crew center at Queen Alia International Airport. Each flight attendant started the program using the Flash icon on the computer which displayed the name and Password page. Each flight attendant was required to enter his name and ID number to access the program and get to the home page and the menu. Then, each flight attendant studied one individual cluster in each session before PFB before proceeding to aircraft. Each lesson includes a number of modules organized as sub-menus or chunks. For example, the first lesson of Planned Emergency is divided into four chunks or modules. They include emergency declaration, flight preparation, flight deck commands and passengers evacuation. Each flight attendant navigated through each lesson using the navigational buttons provided. The presentation of each topic went through the events of instruction by Gagne (1992). The sixth and seventh events include the elements of interactivity of the program where questions were provided and then followed by feedback. Each flight attendant answered the questions correctly before he/she finished the lesson.

7.10 Administration of the Program (Pilot Study): One to One Evaluation:

In this evaluation the researcher asked one flight attendant to conduct a full review of the VSIMI package and amendments were done accordingly.

Small Group Evaluation:

The researcher administered the program to 28 flight attendants who followed the program in full and answered the achievement test.

On the other hand, the prototype was presented to programming experts to identify technical problems and to instructional designers for recommendations on visuals and audios of the program. The feedback was used to improve the program.

The study was pilot tested on two levels following the specifications of the Dick and Carey model. The pilot study was conducted in the crew center at Queen Alia International Airport in Amman.

7.11 Instruments of the Study

This study included one instrument developed by the researcher, namely the achievement test which includes 50 test items of which 11 are recall questions (verbal information) and 39 are mastery questions (intellectual skills) divided into 11 questions on discriminations, 5 five questions on concepts, 10 questions on rules and 13 questions on higher order rules. These questions were based on Gagne's domains of learning of both verbal information and intellectual skills.

7.12 Instruments Validity and Reliability:

7.12.1 Validity and Reliability of the Achievement Test

According to Gay and Arasian (2003), validity verifies that the test measures what it should measure. To assess the validity of the achievement test in this research, it was given to a jury of six judges who are managers from the In-flight Services of Royal Jordanian airline who checked on the content. The test was also presented to four specialists in English language to check on the accuracy of the language used.

The achievement test reliability was verified through the use of Spearman-Brown Coefficient available in the SPSS software. 28 flight attendants were chosen for the pilot study. The items were also analysed for discrimination index and difficulty index before the achievement test is finalized.

8. Data collection and Analysis

The data was analyzed using ANCOVA with the pre-test scores as covariate as they involved learning and knowledge acquisition. The level of significance is set at $p = 0.05$. As the testing of the hypotheses involved two-tailed analysis, the effective level of significance is $p = 0.025$ (Cohen, 2000).

8.1 Revising Instructional Material

Revising instructional material was based on the data obtained from the subject matter experts, from one to one and from the small group from in-flight services in Royal Jordanian airline. In addition, comments provided by instructional designers were taken into consideration in amending the prototype.

8.2 Design and Conduct Summative Evaluation

Summative evaluation consisted of an investigation of whether reflection and review during PFB were needed in using the package, which represented the effectiveness and viability of the whole project of instructional design with or without reflection and review discussions during PFB. In this research the summative evaluation was the post-achievement test.

8.3 Findings

8.3.1 Results of Pilot Study

8.3.1.1 Reliability of the achievement test

The test reliability was verified through Spearman-Brown Coefficient $r = 0.863$ on a group of 28 flight attendants. The flight attendants were chosen randomly from the population of the study. Members of the staff who participated in the pilot study were excluded from the actual study.

8.4 Pretest results

8.4.1 ANOVA of Pre-Test Results for Planned Emergency, Fire Fighting and First Aid.

Table 1 gives the means, standard deviations and results of ANOVA for the pre-test results by total score and sub-categories of Planned Emergency (PE), Fire Fighting (FF), and First Aid (FA). The mean total score for the VSIMI + RR group is $X = 34.03$ with s.d. $= 5.58$, while the mean total score for the SIMI group is $X = 33.00$ with s.d. $= 5.75$. Results of the ANOVA test showed that $F(1, 68) = 0.577$ at $p = 0.450$. As $p > 0.05$, there is no significant difference between the two groups with regard to prior safety knowledge and skills. Further analysis of the safety knowledge and skills in the categories of Planned Emergency (PE), Fire Fighting (FF), and First Aid (FA) revealed similar results, namely that there were no significant differences between the two groups in all knowledge and skills categories (Table 1).

8.4.2 ANOVA of Pre-Test for Intellectual Skills and Verbal Information

Table 2 gives the means, standard deviations and results of ANOVA for the dimensions of intellectual skills and verbal information. Results of the ANOVA test showed that $p > 0.05$ for all measures, indicating that there were no significant differences between the two groups with regard to the dimensions of intellectual skills and verbal information (Table 2).

Table 1: Means, Standard Deviations and Results of ANOVA for Pre-Test Results

		Mean	Std. Deviation	N	Results of ANOVA
Pre_Total	VSIMI+RR	34.03	5.58	35	$F_{(1, 68)} = 0.577$
	VSIMI	33.00	5.75	35	$P = 0.450$
Pre_PE	VSIMI+RR	13.82	2.81	35	$F_{(1, 69)} = 0.560$
	VSIMI	13.31	2.93	35	$P = 0.457$
Pre_FF	VSIMI+RR	10.45	2.31	35	$F_{(1, 69)} = 0.929$
	VSIMI	9.91	2.39	35	$P = 0.339$
Pre_FA	VSIMI+RR	9.74	2.27	35	$F_{(1, 69)} = 0.003$
	VSIMI	9.77	2.28	35	$P = 0.958$

Table 2: Means, Standard Deviations and Results of ANOVA in the pre-test for intellectual skills and verbal information

		Mean	Std. Deviation	N	Results of ANOVA
Pre_discrimination	VSIMI+RR	8.31	1.64	35	$F_{(1, 68)} = 0.114$
	VSIMI	8.17	1.89	35	$P = 0.736$
Pre_Concepts	VSIMI+RR	3.77	1.14	35	$F_{(1, 68)} = 0.104$
	VSIMI	3.68	1.08	35	$P = 0.748$
Pre_Rules	VSIMI+RR	6.68	1.84	35	$F_{(1, 68)} = 0.000$
	VSIMI	6.68	2.14	35	$P = 1.000$
Pre_HORules	VSIMI+RR	6.77	1.92	35	$F_{(1, 68)} = 1.144$
	VSIMI	6.28	1.87	35	$P = 0.289$
Pre_Verbal_Info	VSIMI+RR	8.48	1.37	35	$F_{(1, 68)} = 0.829$
	VSIMI	8.17	1.50	35	$P = 0.366$

8.5 Testing of the Hypothesis

H01: There are no significant differences in (a) overall performance and performance in (b) planned emergency, (c) firefighting and (d) first aid situations between groups that employ vocational systematic and interactive multimedia instruction with and without reflection and review.

8.5.1 ANCOVA of Post-Test Results for Planned Emergency, Fire Fighting and First Aid

Table 3 gives the Means, Standard Deviations and Results of ANCOVA for Post-Test Results for the total score and the scores for Planned Emergency, (b) firefighting and (c) first aid situations. The mean total score for the VSIMI + RR group is X = 44.83 with s.d. = 3.45, while the mean total score for the VSIMI group is X = 43.17 with s.d. = 4.15. The mean for the VSIMI + RR group showed an increase of 10.8 points over the pre-test score while the mean for the VSIMI group showed an increase of 10.17 points over the pre-test score.

Results of the ANCOVA test showed that $F_{(1, 67)} = 2.726$ at $p = 0.103$. As $p > 0.05$, there is no significant difference between the two groups with regard to the learning of safety knowledge and skills through the two methods. Further analysis of the safety knowledge and skills in the categories of Planned Emergency (PE), Fire Fighting (FF), and First Aid (FA) revealed that $p > 0.05$ for all categories, indicating that there were no significant differences between the two groups in acquiring new vocational knowledge and skills by the categories (Table 3). Thus H01 is accepted. The findings indicate that the VSIMI + RR and the VSIMI methods were equally effective in improving mastery in the required safety knowledge and skills. The review and reflection activities conducted by the supervisors did not significantly contribute to the gain of the vocational safety knowledge and skills among the flight attendants.

Table 3: Means, Standard Deviations and Results of ANCOVA for Post-Test Results

		Mean	Std. Deviation	N	Results of ANCOVA
Total	VSIMI+RR	44.83	3.45	35	$F(1, 67) = 2.726$
	VSIMI	43.17	4.15	35	$P = 0.103$
PE	VSIMI+RR	18.00	1.684	35	$F(1, 67) = 0.830$
	VSIMI	17.60	2.09	35	$P = 0.366$
FF	VSIMI+RR	13.88	1.13	35	$F(1, 67) = 2.25$
	VSIMI	13.31	1.55	35	$P = 0.113$
FA	VSIMI+RR	13.83	1.48	35	$F(1, 67) = 4.507$
	VSIMI	13.06	1.53	35	$P = 0.037$

8.5.2 ANCOVA of Post-test Scores of Intellectual Skills and Verbal Information

H02- There are no significant differences in mastery or performance in (a) discrimination, (b) concepts, (c) rules, (d) higher order rules and (e) verbal information situations between groups that employ systematic and interactive multimedia instruction with and without reflection and review.

Table 4 gives the Means, Standard Deviations and Results of ANCOVA for discrimination, (b) concepts, (c) rules, (d) higher order rules and (e) verbal information. The mean score for discrimination for the VSIMI + RR group is X = 10.26 with s.d. = 1.07, while the mean total score for the VSIMI group is X = 9.80 with s.d. = 1.26 For discrimination the mean for the VSIMI + RR group showed an increase of 1.95 points over the pre-test score while the mean for the VSIMI group showed an increase of 1.63 points over the pre-test score. Results of the ANCOVA test showed that F (1, 67) = 2.54 at p = 0.115. As p > 0.05, there was no significant difference between the two groups with regard to discrimination.

The mean score for concepts for the VSIMI + RR group is X = 4.66 with s.d. = 0.59, while the mean total score for the VSIMI group is X = 4.49 with s.d. =.89 For concepts the mean for the VSIMI + RR group showed an increase of 0.89 points over the pre-test score while the mean for the VSIMI group showed an increase of 0.81 points over the pre-test score. Results of the ANCOVA test showed that F (1, 67) =.884 at p = 0.350. As p > 0.05, there was no significant difference between the two groups with regard to concepts.

The mean score for rules for the VSIMI + RR group is X = 9.17 with s.d. = 0.86, while the mean total score for the VSIMI group is X = 8.74 with s.d. = 1.17. For rules the mean for the VSIMI + RR group showed an increase of 2.49 points over the pre-test score while the mean for the VSIMI group showed an increase of 2.06 points over the pre-test score. Results of the ANCOVA test showed that F (1, 68) = 3.076 at

P = 0.084. As p > 0.05, there was no significant difference between the two groups with regard to rules.

The mean score for HO rules for the VSIMI + RR group is X = 11.43 with s.d. = 1.46, while the mean total score for the VSIMI group is X = 11.06 with s.d. = 1.43. For HO rules the mean for the VSIMI + RR group showed an increase of 4.66 points over the pre-test score while the mean for the VSIMI group showed an increase of 4.78 points over the pre-test score. Results of the ANCOVA test showed that F (1, 67) = 0.933 at P = 0.338. As p > 0.05, there was no significant difference between the two groups with regard to HO rules.

The mean score for verbal information for the VSIMI + RR group is X = 10.20 with s.d. = 0.96, while the mean total score for the VSIMI group is X = 9,89 with s.d. = 1.66. For verbal information the mean for the VSIMI + RR group showed an increase of 1.72 points over the pre-test score while the mean for the VSIMI group showed an increase of 1.72 points over the pre-test score. Results of the ANCOVA test showed that F (1, 68) = 0.96 at p = 0.330. As p > 0.05, there was no significant difference between the two groups with regard to verbal information.

In all cases the ANCOVA tests revealed that p > 0.05, thus, H02 is accepted. The findings indicate that the VSIMI + RR and the VSIMI methods were equally effective in improving mastery of intellectual skills and recall of verbal information. The review and reflection activities conducted by the supervisors did not significantly contribute to the gain of the intellectual skills and recall of verbal information among the flight attendants but the gain scores were high in the total mean score.

8.6 Summary of Findings

The presented analyses were conducted based on the data collected and the findings are summarized as follows:

The number of items categorized as difficult was reduced by half and there was a slight increase in

magnitude for the difficulty indices of the remaining difficult items.

The means for the VSIMI + RR and VSIMI groups showed an increase of 10.8 and 10.17 points respectively over the pre-test scores and there was no significant difference between the treatment methods. The review and reflection activities conducted by the supervisors did not significantly contribute to the gain of the cabin safety knowledge and skills among the

flight attendants. This indicated that the VSIMI + RR and the VSIMI methods were equally effective in improving mastery in the vocational cabin safety knowledge and skills.

There was no significant difference between the VSIMI + RR and VSIMI with regards to performance in discrimination, concepts, rules, higher order rules and verbal information.

Table 4: Means, Standard Deviations and Results of ANCOVA for intellectual skills and verbal information

		Mean	Std. Deviation	N	Results of ANOVA
Discrimination	VSIMI+RR	10.26	1.07	35	$F(1, 67) = 2.544$
	VSIMI	9.80	1.26	35	$P = 0.115$
Concepts	VSIMI+RR	4.66	0.59	35	$F(1, 67) = 0.884$
	VSIMI	4.49	.89	35	$P = 0.350$
Rules	VSIMI+RR	9.17	0.86	35	$F(1, 68) = 3.076$
	VSIMI	8.74	1.17	35	$P = 0.084$
HO Rules	VSIMI+RR	11.43	1.46	35	$F(1, 67) = 0.933$
	VSIMI	11.06	1.43	35	$P = 0.338$
Verbal_Info	VSIMI+RR	10.20	0.96	35	$F(1, 68) = 0.964$
	VSIMI	9.89	1.66	35	$P = 0.330$

9. Discussion, Conclusion and Recommendation
9.1 DISCUSSION

The goal of this study was to investigate the effect of systematic interactive multimedia instruction (VSIMI) with reflection and review (RR) on (i) improving overall performance and performance in planned emergency, fire fighting and first aid situations, (ii) improving performance or mastery in discriminations, concepts, rules, higher order rules and verbal information. Performance by Method and Safety Knowledge and Skills (SKS)

9.1.1 Discussion of the findings of the first question:

Does systematic and interactive multimedia instruction with reflection and review improve overall performance and performance in planned emergency, fire fighting and first aid situations?

The study found that the means for the VSIMI + RR and VSIMI groups were 44.83 and 43.17 respectively from a maximum score of 50 and represented an increase of 10.80 and 10.17 points respectively over the total pre-test scores. There was also no significant difference between the treatment methods. Also found were means of 18.00 and 17.60 from a maximum score of 20 with gains of 4.18 and 4.29 respectively for Planned Emergency, means of 13.88 and 13.31 from a maximum score of 15 and gains of 3.43 and 3.40 respectively for Fire Fighting, and means of 13.83 and 13.06 from a maximum score of 15 and gains of 4.08 and 3.86 respectively for First

Aid. The VSIMI + RR group reported slightly higher means and gain scores but the differences were not significant. The conclusions that can be made from these findings are that VSIMI + RR and the VSIMI methods were equally effective in improving mastery in the cabin safety knowledge and skills (SKS). There were dramatic improvements but review and reflection activities conducted by the supervisors did not significantly contribute to the gain of the cabin vocational SKS among the flight attendants.

The improvements in performance in vocational SKS with respect to PA, FF and FA were due to the merits of using Gagnes' theory of hierarchical learning and the use of multimedia and instructional systematic design (ISD) by Dick and Carey (2001). Each segment of the PA, FF and FA was constructed following the hierarchy of knowledge that arranged the required skills and knowledge from simple to complex and then was presented following of the events of instruction through a multimedia program. Hierarchical learning as prescribed by Gagne allowed for the basic concepts and verbal information items to be integrated into more complex structures such as rules and with successful application of the rules developed higher order rules. The events of instruction assisted the acquisition of the concepts and verbal information items as well as the successful execution of the rules during problem solving.

Flight attendants improved their scores in intellectual skills and verbal information due to the effectiveness of Gagne's theory of hierarchical learning which was adopted in the VSIMI. Thus, flight attendants were able to discriminate between the various concepts needed to ascend to higher levels in the hierarchy. For example, flight attendants were able to discriminate between the two concepts of normal and emergency calls which reported to be crucial and life threatening (NTSB, 1992). A higher level in the hierarchy represents rules such as applying the appropriate procedure after the emergency call is discriminated. This rule includes informing the supervisor of the emergency and the actions needed. Then the supervisor will inform flight attendants through a conference call about details of emergency. The highest level in the hierarchy is higher order rule which is the ability of the flight attendants to use and connect between more than one rule to solve the problem. Higher order rules refer to the ability of flight attendants to efficiently prepare passengers, the cabin, lavatories and galleys for emergency landing in addition to their ability to discriminate between and use the various concepts and rules to carry out successful evacuation.

Previous research supports the findings in this study on the effectiveness of hierarchical learning in acquiring concepts and making use of rules to ascend to higher order rules and problem solving. Griffith, Kass and Cornish (1983) reported the positive significance of using Gagne's hierarchical learning in the context of chemistry on learning Mole concepts and higher order rules. This is also consistent with Warkentin (1990) who found the effectiveness of hierarchical learning in learning science in enhancing the achievement in concepts and mental skills among learners, which support the fact that flight attendants were able to enhance their cognition and regulate their SKS which revealed the effect of metacognitive capabilities enhanced by the SIMI (Bandura, 1991).

The design of the VSIMI package allowed for the development of vocational expert schema (Ericsson, 1996; Ericsson, Patel and Kintsch, 2000; Shy 2008) by ensuring that every required item and procedure of vocational SKS is introduced into the learners' memory (Taylor and MacKenny, 2008) and then strengthened through elaboration and application in problem solving tasks (Gagne, Yerkovich and Yerkovich, 1993).

Previous research referred to the virtues of Gagne's theory of hierarchical learning as a comprehensive instructional approach intended to transform novice to experts through using the events of instruction in training (Gagne, 1992; Stepich, 1991; Bani Salameh et al, 2010). The findings in this study are also supported by previous research, such as by Griffith et al (1983) and Warkentin (1990) in the context of science learning, Harrison (1991) and Janicki & Liegle (2001) in the contexts of multimedia and web-based instruction, Green (2008) in the context of training. Above all, Griffith et al reported that the organization of mole concepts according to Gagne's hierarchical learning was effective when measured through multiple-choice questions. This method enabled learners to learn basic factors that transferred them to higher order rules. These authors further attributed that the gains in performance were due to hierarchical learning and the use of the events of instruction. Thus, the results of this study showed significant with regard to Gagne's hierarchical learning consistent with the findings in other studies.

On the other hand, the VSIMI study also had gone through the process of instructional design (Dick and Carey, 2001) which went through the procedure of using integrated design process that used expert review, one to one evaluation and small group evaluation for formative evaluation. Consistently, Hsueh (2005) found the positive effect of designing, developing and evaluating Chinese character tutorial through hypermedia. He found out that the program facilitated students learning outside the class and students showed positive interest towards the program.

Task analysis in this study helped flight attendants use the component skills required to perform a task based on the Gagnes' taxonomy of intellectual skills and verbal information. (Gagne, 1992). Task analysis divided SKS into smaller chunks that are made of rules, concepts and discriminations, which are needed to achieve the main objective (Gagne, 1992; Dick and Carey, 2001; Cristian 2007; Islam and Trolley, 2006; Seamster, Redding & Kaempf, 2000). The advantage of using task analysis was investigated in other studies; O'Hare, Wiggins, Williams and Wong (1998) found that task analysis provide proper training with cognitive task analysis (CTA) that could provide tailored guide and cues indicative of danger in the environment in the context of expert river guides. Schaafstal, Schraagen and Van Berlo (2000) found that task analysis effective in improving performance in complex cognitive systems. Lajoie, Azeveo and Fleiszer (1998) found that CTA effective in transforming novices to experts through using computer based systematic training. Velmahos, Toutouzas, Sillin, Chan and Clark (2004) pointed out to have effective training, technical skills should be instructed through a step-by-step, standardized, analytical approach to achieve deep understanding. Bani Salameh et al (2010) referred to CTA as a joint cognitive system among both flight attendants and pilots, which is crucial for the safety of airplane and its occupants. Bani Salameh et al recommended using

ISD and task analysis in designing instruction on cabin safety for flight attendants through following ISA model (Bani Salameh et al, 2009).

Previous research indicated that task analysis has a positive effect on knowledge, skills and problem solving. Task analysis helped attaining the objectives set already (Cristian, 2007). Task analysis adopted in the design and development of VSIMI divided instruction into clusters or chunks (Dick & Carey, 2001) and used realistic scenarios of SKS (Kaveevivitachai et al, 2009). Endsley & Garland (2000) also pointed out that cognitive task analysis provided a shared content by team members as in aviation operations. Similarly, Bani Salameh et al (2010) reported that simulations that enhance professionalism are crucial to solving emergency situations through using task analysis in joint cognitive systems among flight attendants and the captain.

In the context of multimedia, Frear & Hirschbuhl (1999) reported significant effects of interactive multimedia instruction on achievement and problem solving skills. Cherret et al (2009) found that interactive video was more effective than lecture-based instruction in the context of engineering. Feinstein, Dalbor & McManus (2007) also reported significant effects of technology-based instructional online training on learners' food safety and sanitation knowledge. Kaveevivitachai et al (2009) found that multimedia animation and audio enhanced performance skills and they concluded that realistic scenarios enhanced problem solving and skills decision making. In the context of industrial education, Alomary (2006) found positive significance of computer-based instruction compared with the traditional method of teaching. Another study by O'Haire, Wiggins, Williams & Wong (1998) found the significant effect of a multimedia program based on cognitive task analysis in helping expert river guides take correct safety decisions. Janicki and Liegle (2001) also reported positive effects of CBT using the events of instruction. Their prototype used proved significant 15% more than the traditional methods. Nam (2003) also found the positive effect of web-based environment for Global Positioning System (GPS) using Gagne's domains of learning and events of instruction.

Previous research referred to the effect of multimedia and simulation on learners' retention of vocational knowledge and skills and problem solving capabilities. Ramsey (1996) found that the use of multimedia provided learner control, meaningful learning that provided better retention, organization and catered for individual differences, and helped learners construct vocational mental models. Petit (1994) found that simulated mock industrial facility

was more effective than text based instruction. Likewise, Johnson (2009) found that interactive multimedia enabled learners to control the learning process and enhanced autonomous learning experience that had significant effect on retention and application of vocational knowledge and skills. Au (1995) found that interactive multimedia was more effective than text only. The results of the present study along with the existing literature showed that the VSIMI through the use of simulation and multimedia was capable of providing intuitive navigation tools and utilizing realistic simulation of the actual environment of the workplace. The simulations employed panels, devices and equipment of the aircraft cabin that were familiar to the flight attendants. The VSIMI also used an orientation of the standard operating procedure (SOP) that allowed for very efficient encoding and storing of the information presented (Bani Salameh et al, 2010).

The flight attendants were also familiar with the equipment of and layout of the aircraft which provided the elements of intuitivity, which is facilitated by the use of hierarchical structures. The VSIMI provided meaningful learning for training flight attendants through authentic visual metaphors or internal picture of how things function (Jonassen, 2009). Ericson (2009) found that learning hierarchy presented through learning curves enhance competence building on the accumulation of vocational training episodes. He emphasized that higher levels of vocational training and performance could be attained through the simulation of the realities of war, assessment and feedback of performance. Ericson recommended this method to be presented to militants just before wartime operation for them to have a mental picture of the situations when needed.

In the VSIMI the use of multimedia interconnected chunks or clusters which enhanced flight attendants SKS have the potential of creating deep understanding and knowledge retrieval (Hasselbring, 1994) and could help in comprehension of SKS. The use of chunking which is a privilege in task analysis also enabled flight attendants to achieve deep learning. This is consistent with Velmahos, Toutouzas, Sillin, Chan and Clark (2004) and Mayer (2001) who pointed that step by step skills and segmentation of instruction allows for deep understanding. Lajoie, azeveo, and Fleiszer (1998) found that the use of CTA through CBT for nurses could help transform novice to experts.

Kraus & Gramopadhye (1999) studied the effectiveness and applicability of computer-based multimedia team vocational training for aircraft maintenance technicians, and identified some of the features of such programs that were advantageous to the technicians. These features can be used to explain

how and why the flights attendants in this study were able to perform better, in terms of gaining vocational safety knowledge and skills. The first feature is standardization, whereby the VSIMI program provides a standardized, systematic and consistent instruction and curriculum to all the participants of the study. Kraus & Gramopadhye (1999) also referred to the effectiveness and applicability of computer-based multimedia in improving record keeping for aircraft maintenance technicians. Record keeping improves flight attendants' progress by giving feedback in the form of answers to the questions. Such immediate feedback helped the flight attendants to identify any errors made, and help them mend their errors while their 'focus of attention is still on the item they have failed to answer correctly' (Banados, 2006, p. 539).

Other literature, however, does not completely support the finding in the first question. For example, Lowe (2003) claimed that multimedia distracted learners' attention. Ramsey (1996) also found that multimedia creates the problem of cognitive overload which could be attended to through using appropriate colors, font size and content sequencing. Ramsey (1996) also found out that multimedia interface design was not effective compared with text based instruction due to lack of instructional systematic design (ISD) and lack of interactivity. Mayer (2001) and Moreno (2000) found that dividing animations into smaller chunks or clusters proved more effective learning than multimedia alone. Graci et al (2007) found that multimedia alone is not adequate but using animation with proper theory guarantees success among students.

One reason why RR did not improve mastery of SKS in PA, FF and FA is that RR was conducted during the briefing session which was limited in time and the flight attendants were preparing and attending more to the vocational duties they had to do onboard after PFB. Other studies might investigate the effect of RR during Basic safety training (BST) or refresher training (RT) where flight attendants would have more time with less stressful environment. The case in this research made use of reflection and review activities as an additional requirement with VSIMI.

9.1.2 Discussion of the findings of the second question:

Does systematic and interactive multimedia instruction with reflection and review improve performance or mastery in discriminations, concepts, rules, higher order rules and verbal information?

An analysis of the vocational safety knowledge and skills (SKS) based on Gagne's taxonomy revealed that there were impressive gains in performance by both groups but there were no significant differences between VSIMI + RR and VSIMI groups with respect to intellectual skills (discrimination, concepts, rules,

higher order rules) and verbal information. The VSIMI method, with and without reflection and review, was equally effective in enhancing safety knowledge in the contexts of verbal information and intellectual skills (discrimination, concepts, rules and higher order rules). These findings are consistent with (Schaafstal, Schraagen & Van Berlo, 2000; Velmahos, Toutouzas, Sillin, Chan & Clark, 2004) who attributed the increase in performance to cognitive task analysis (CTA) which breaks down the intellectual skills according to complexity of the tasks, i.e. into a hierarchical order, and giving full attention to the mastery of each level. These include stimulus recognition, response generation, procedure following, use of terminology, discriminations, concept formation, rule application, and problem solving. By following the hierarchy model, the flight attendants were able to identify prerequisites, as well as the important concepts and ideas that should be understood, internalized and completed in order to facilitate learning at each level, as Gagne (1992) recognized in his concept of learning conditions. As such, this kind of structured learning provides a basis for the flight attendants to learn and experience according to sequencing of instruction that have been planned and arranged logically and systematically.

The program consisted of sufficient considerations for the requirements of learning following the limitations of short-term memory (STM) and the complexity of managing knowledge in the long term memory (LTM) (Gagne and White, 1978; Taylor and MacKenny, 2008) through the use of the events of instruction and this contributed to the increase in performance. This is consistent with Nam (2003) who found the positive effect of Gagne's domains of learning and events of instruction in learning about GPS systems. These events of instruction are not necessarily followed in order and not supposedly taken as a whole set (Gagne, 1988). The events of instruction were used to establish full mastery of the intellectual skills and verbal information. The first event of gaining attention of a learner appeals to learner's interest and motivation. (Gagne, 1992). An example on gaining attention is presenting a photo of ditching in a lesson about planned emergency. The second event is informing the learner of the objective which activated the executive control or metacognitive processes which must be clear to the learner and must be observable. The third event of stimulating recall of prior knowledge shifted prerequisites to the forefront of memory or short-term memory when starting instruction. Presenting the stimulus means providing cues such as highlighting a picture in the lesson. To assure successful learning, component ideas such as concepts and rules should be reminded of. Recall of prior vocational knowledge

differs according to the type of domain; that is, the recall of prior vocational knowledge for intellectual skills includes concepts and rules while that of verbal information requires organized set of knowledge (Gagne, 1992). The fourth event is the material which activates the selective perception on the part of the learner. The fifth event is providing learning guidance which helped the flight attendant to keep on tract and established semantic encoding to the long-term memory and hints for retrieval to the short-term memory. Guidance should not be overemphasized especially with skillful learners. Therefore, it provided little hints that were useful for the flight attendants (Gagne, 1992). Providing learning guidance was intended to relate the knowledge learnt to familiar masses of organized knowledge referred to as schema. For procedure it is meant to provide clearer steps. Eliciting performance referred to flight attendants answering questions to show they have learned. Giving informative feedback meant as corrective feedback which aimed at correcting wrong answers.

The third factor that increased performance was the levels of realism embedded in the CBT programs. The VSIMI included realistic and authentic video demonstrations that simulated the actual environment through demonstrating the standard procedure to be applied in the emergency procedures that represented the intellectual skills. This is supported by Dempsey, Lucassen and Ramussen (1993) who found that realistic simulation reflects positively on retention Randel et al (1992) reported the significant effect of simulation as it enhances more active participation and involvement of the learners' in instruction which also reflected positively on their motivation. Similar results were reported by (Feinstein, Raab and Stefanelli, 2005) in the hospitality field. Hoffler and Leutner (2007) also found out that outcomes are enhanced when animations include realistic presentations and procedural-motor skills.

Another advantage that enhanced flight attendants SKS in the VSIMI program is task analysis (Dick and Carey, 2001). The use of task analysis based on Gagnes' hierarchical learning improved flight attendants' comprehension and projection of SKS. Task analysis helped enhance flight attendants' memory through providing SKS in a form of chunks which enhanced their expert memory (Bransford, Brown, Cocking, 2002). Taylor and MacKenny (2008) defined memory as the ability of an individual to retrieve previously learned information or skills. They referred to three types of memory; the sensory memory, the short-term memory, and the long-term memory. The sensory memory has to do with human senses like hearing and seeing; this memory lasts for milliseconds. The short-term memory lasts for seconds. Chunking is helpful for short-term memory;

Chunking is defined as a few pieces of information grouped together. As for the long-term memory, they pointed out that there is a consensus that it is the type of memory that keeps information for a long period of time and it is an associative memory based on cognitive theory. Sweller, Merrienboer, & Paas, (1998) refer to chunking, which could be constructed through task analysis, as a way of facilitating storing information into long-term memory.

Flight attendants mastery of intellectual skills could be explained through Gagne and White (1978) who referred to four kinds of memory structures: propositions, images, episodes, and intellectual skills. The performance outcome for propositions is knowledge stating and it is composed of hierarchical structure which allows for literal storage and retrieval. Thus, flight attendants were able to store information into the memory structure and retrieve it immediately and literally. The use of Gagne's domains of learning of intellectual skills helped flight attendants retrieve and decode vocational SKS through super-ordinate and coordinate class. The intellectual skills memory is the memory where flight attendants encoded information into existing processing structure or schema. The first way to encode information is called accommodation where students add information to existing schema by instantiating the variables of that schema. Retrieval here requires more time and it carries the potential of error. The second is reorganization where new schema is created internally not externally to account for a new phenomena.

The increase in performance was due to the program itself but not to the review and reflection activities conducted during pre-flight Briefing (PFB). Previous literature defined RR as intended to enhance practice in the field (Donaghy and Morss, 2000) through a variety of tools such as stop and think and Sue diaries (Moon,2004), to reflect on learners' study experience (Lockyer and Thivierge, 2004), and was also defined as the intellectual activities performed to appreciate and evaluate the subject of focus (Boud, Keogh and Walter,1985). Chute and Weiner (1995) found that reflections enhance high expectations, increase interactions, clarify hidden issues and review security and emergency procedures. Furthermore, in the context of nursing, Webster (2008) found that reflection changed negative attitudes to positive ones even when learning was helpful. Arnold and Boggs (2007) stated that self reflection among learners enhances self awareness. Nielsen, Stragnell and Jester (2007) found that the use of reflection by using a guide is helpful decision making. The guide in this research is the reflection and review scripts which are in the form of Question and Answer (Q & A).

In this study, reflection and review activities conducted by the supervisors did not add to the safety

knowledge and skills among flight attendants. The reflection and review activities consisted of Q & A activities involving recall, comprehension, elaboration, analysis and assessment of the main points of the lessons led by the in-flight supervisor during PFB. These activities were hypothesized to strengthen mastery through rehearsals and decoding activities (Ericsson and Delaney, 1999) of cabin vocational SKS without the addition of new facts or procedures. As such, no new knowledge was added when the learning through VSIMI was complete and thorough. The reflection and review activities had only strengthened the storage and retrieval of the VSKS among flight attendants. In this study RR helped enhancing practice, reflecting on study experience, appreciating and evaluating and revealing hidden results but not to enhance recall of vocational safety knowledge and skills.

The VSIMI method whether with review and reflection or not was effective in enhancing vocational safety knowledge in the contexts of intellectual skills (discrimination, concepts, rules and higher order rules) and verbal information. Thus the findings of this study suggest that systematic, interactive and realistic multimedia instruction is effective in promoting mastery of cabin vocational SKS and works across all dimensions of intellectual skills and verbal information. Review and reflection activities did not contribute to additional gain of vocational knowledge and skills.

The findings in this study contradict Yost (2004) who argues that reflection is an action which manifests in a product and reported that reflection activities strengthened performance among teacher trainees. Other findings that are not consistent with the findings in this study is the study by Ericsson (2009) who found that warfare training that included review questions supported good training and the study by Daley (1999) who found that reflection enhanced learning and professional behavior and Boud (2001) also found that reflection enhanced motivation to question the content that improved retention and interactivity.

However, another possibility why RR did not improve mastery of SKS in intellectual skills and verbal information is that RR was conducted in the briefing time which was limited time and flight attendants were thinking of the vocational duties they had to do onboard instantly after PFB. Other studies might investigate the effect of RR during Basic safety training (BST) or refresher training (RT) where flight attendants would have more time with less stressful environment.

It can be concluded that the use of reflection and review by the supervisor also did not improve the performance in intellectual skills and verbal

information because the strategy employed did not involve deep thinking and was merely to get learners to remind themselves what they already knew or giving them opportunity to practice further and develop automaticity (Johnson, 1997). As per current practice, the time specified for RR was limited and supervisors were as usual reviewing on the facts, rules and concepts but not on higher order rules. First, the reason why reflection and review did not work might be because flight attendants got thorough training through the VSIMI that was based on Gagne's hierarchical learning and events of instruction. In addition, a privilege of the VSIMI is enhancing mental models which created deep understanding and knowledge retrieval (Hasselbring, 1994). Therefore, flight attendants achieved deep understanding from the VSIMI and RR did not add anything significant to SKS.

This study along with the literature on hierarchical learning indicated that the majority of studies support the benefits of hierarchical learning in enhancing learners' achievement and problem solving skills in a hierarchical manner. This study tackled on-the-job training in the duty loop of ISA model; other studies might investigate a broader scope particularly the effect of VSIMI with and without reflection and review on flight attendants SKS before flight attendants start their flight duties particularly during basic safety training (BST) in the training centre.

9.2 Summary and Conclusions

The conclusions that can be made from these findings are that VSIMI + RR and the VSIMI methods were equally effective in improving mastery in the cabin vocational safety knowledge and skills and in enhancing vocational safety knowledge in the contexts of verbal information and intellectual skills (discrimination, concepts, rules and higher order rules). There were dramatic improvements but review and reflection activities conducted by the supervisors did not significantly contribute to the gain of the cabin vocational SKS among the flight attendants.

Thus, the findings of this study suggest that vocational systematic, interactive and realistic multimedia instruction is effective in promoting mastery of cabin vocational SKS with respect to PE, FF and FA and works across all dimensions of intellectual skills and verbal information and improved their perceptions towards the factors of ISA model. These findings suggest the VSIMI with RR should be adopted for the training and maintenance of expertise of flight attendants.

9.2 Recommendations and Implications for Future Theory and Practice

In conclusion this study shed light on important aspects of vocational training in a viable environment where the correct actions by flight attendants have the

high potential of saving human life. The ISA model (Bani Salameh et al, 2010) opens broad avenues for improvement of SKS training among flight attendants. There is an urgent need to maintain, improve and enhance the various dimensions in ISA model, particularly the duty loop, through using vocational systematic interactive multimedia instructional packages based on proper theory and delivered to flight attendants before pre-flight briefings.

RR based on the standard operating procedures (SOP) did not work as expected; so further research should be conducted to investigate RR based HOR. This study employed a small sample from a medium sized airline that further investigation should be conducted involving flight attendants from larger fleets. Data should also be analyzed by gender work experience and other demographic factors such as levels of education and previous experience.

Gagnes' theory of hierarchical learning along with instructional systematic design (ISD) should be used for the rest of aircraft types and all the safety manual. In addition, this study used two domains out of the five domains of learning by Gagne. Future research should use all the five domains including psychomotor which could measure certain variables inside the aircraft or in mock facilities in the training center. Each flight attendant should also be provided with a CD so that he/she can refer to SKS at their own pace.

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