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Research and innovation in teaching and learning are prime topics for the *Journal of Instructional Technology and Distance Learning* (ISSN 1550-6908). The Journal was initiated in January 2004 to facilitate communication and collaboration among researchers, innovators, practitioners, and administrators of education and training involving innovative technologies and/or distance learning.

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Editorial

Scalability and progressive curriculum

Donald G. Perrin

As theories of teaching and learning change, learning environments and curriculum must also change. The brick-and-mortar university survived for centuries because change was slow or non-existent.

Universities ... were organized as they still are, not for inquiry and research into the unknown but for the learning (and teaching) of the known. They are scholarly, not scientific, and if I were to take a degree I must choose my categories and stick to them.

This was Lincoln Steffans (1931) description of universities in the late 1800s. Today, most university teaching is through lectures. Technological advances in communication often emulate traditional and behavioristic models of instruction and opportunities for constructivist exploration and interaction are largely ignored. Lectures are primarily one-way communication that can be recorded and re-used. “Flip courses” use recorded lecture-presentations for homework so class time can be used for problem solving, dialog and group activities. This initially involves more work for the instructor but increases the quality of learning. It also signals a change in the instructor role from delivery to management of learning.

In the second half of the twentieth century, television, computers, interactive multimedia, hyperlinks and the world-wide-web opened a new era for teaching and learning. Research funded by the Ford Foundation explored teaching by television to multiple classrooms. Options for two-way communication were available on satellite and ground based broadcast systems such as Instructional Television Fixed Service and Interactive Video. Most television options were ultimately replaced by inexpensive alternatives on the world-wide-web.

Learning Management Systems automated enrollment, instruction, evaluation and record keeping. This enabled Open Universities using distance learning to become super-universities with enrollments of the order of a million students. Quality was enhanced by instructional design and professionally produced media. The British Open University used high-quality instructional videos produced by the BBC. Rio Salado Community College in Arizona set up its own production facilities.

The computer solved many problems inherent in older technologies. Fast and inexpensive production made pretesting affordable. Lessons delivered live, in real time, could be recorded and edited. Digitally recorded lessons were easy to update and the most up-to-date version could be accessed anywhere and at any time across the Internet. Once learning materials were generated, evaluation data could be used for continuous quality improvement.

In the late 1990s, the California State Universities were impacted and needed to build one new campus every month to keep up with the demand. There was neither budget nor time for such a building program, so a decision was made to use distance learning to absorb 30% of the increase. This was a good decision for several reasons. It did not require the overhead cost of brick-and-mortar, and it was easily scalable upward or downward based on demand. Most universities in the California State system developed distance learning courses and programs, and some were shared so smaller campuses could offer more courses and degrees. But most important, students who could not attend on-campus programs now had the opportunity for a university education.

Global availability of content through search engines and the internet is steadily displacing the role of the university to teach the known. Will this accelerate the vision of Lincoln Steffens to refocus university programs from content delivery to research, inquiry and exploration of the unknown?

In this issue of IJITDL you will find significant applications of instructional design, constructivism, open and distance learning, and research from different countries to meet the needs of the 21st century.

The Autobiography of Lincoln Steffens (1931) Harcourt, Brace and Company. p131

Editor's Note: This study combines a variety of disciplines related to instructional design to produce an effective validated program of instruction. Detailed planning includes review at every step: needs assessment, goal setting, content selection, design, prototype production and testing for formative evaluation, and production, implementation and evaluation.

Using educational technology for safety training design and evaluation of safety knowledge and skills

Zakaria Bani-Salameh
Saudi Arabia

Abstract

Flight attendants take care of the safety of millions of passengers annually. Their preparedness for onboard duty is assessed by their flight supervisors during preflight briefings and they must undergo annual refresher training courses for recertification. They must also have their safety manuals at all times and refer to them religiously for review and revision. However, many studies have reported specific weaknesses in the flight attendants' abilities that can be attributed to deficiencies in and lack of systematic training. This study proposed and evaluated a set of new methods for enhancing and assessing readiness and expertise among flight attendants. Knowledge and expertise is theorized to reside in schemas which consist of declarative, procedural memories. Thus, the purposes of training are to create expert schemas and to continuously refine them. For this study, knowledge and Expertise are defined in terms of verbal information which is the ability to state facts and procedures, and intellectual skills which are cognitive processes of discrimination and forming of concepts, rules, and higher-order rules following Gagne's (1985) prescriptions. Using educational technology with Flash Cs3, A systematic and interactive multimedia program was developed to deliver the instruction and a 50-item test based on the Gagne's learning hierarchy was constructed to assess the safety knowledge and skills.

Introduction

In-flight safety assurance is a major concern for airlines and is considered to be the flight attendants' major responsibility onboard. The current instructional methods provided for the flight attendants make use of text-based documents including description of the aircraft and emergency procedures. On the other hand, training flight attendants in the basic safety training and refresher training employs power point text-based presentations and illustrations in addition to practical drills through the facilities provided at the training center (JATS).

Current reports shed light on deficiencies of flight attendants training. After reviewing the related literature in the field of flight attendants training, it was noticed that there is a lack of studies that address the context of the flight attendants' safety role onboard. Rhoden , Raltson et al (2007, 538) claimed that:

"Ironically, the safety role of cabin crew (Flight attendants) receives no attention in the academic literature. Given that cabin crew take responsibility for millions of passengers annually, it is argued that the quality of the training delivered to enable them to undertake their safety role effectively is an important consideration for all air transport passengers and airline personnel."

Mahony, Griffiths, Larsen and Powell (2008) found that flight attendants are not properly trained in first aid situations due to the types of instructional techniques employed, variations in program delivery and the time interval between 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. Leocha (2009) referred to the flight attendants' high professionalism which was revealed in the accident of the Hudson River. He pointed out that the actions of the flight attendants in the cabin were the key factor in the successful evacuation of the floating plane.

A review of literature on flight attendants' safety training programs came out with empty hands except for the study by Bani-Salameh, Z., Kabilan, M. & Bani-Salameh, L. (2010b) which investigated the effectiveness of English for Specific Purposes (ESP) multimedia program on flight attendants' safety knowledge and skills. The study made use of Gagne's two domains of learning of verbal information and intellectual skills through using the English for specific purposes (ESP) approach of reading and listening skills. The study found that the ESP multimedia program was significant in terms of recall of safety knowledge and skills in favor of the experimental group. The study recommended using similar ESP programs for training flight attendants. Bani-Salameh, Z., Kabilan, M. & Bani-Salameh, L. (2010b) recommended using systematic design of instruction to enhance expertise among flight attendants. Systematic design of instruction identifies what the learner will be able to do at the end of instruction (Dick & Carey, 2001; Frisby & Day, 2003). Bani-Salameh, Z., Abbas, M., Kabilan, M., Mei, L. & Bani-Salameh, L. (2009); Bani-Salameh, Z., Abbas, M. & Bani-Salameh, L. (2010a) and Bani-Salameh, Z., Kabilan, M. & Bani-Salameh, L. (2010b) identified flight attendants needs to be trained using systematic interactive multimedia instruction. Lowe (2003) pointed out that despite the fact that creating interactive multimedia sources is available to everyone, designing good material should be based on proper criteria. Johnson, (2009) stated that instructional system design is the best method to design interactive multimedia and Mahnaz (2001) proposed using systematic procedures and interactive multimedia environments.

The focus of this paper is establishing the validity of a systematic interactive multimedia instruction (SIMI) for teaching safety knowledge and emergency procedures for flight attendants. The need to research and develop SIMI training for flight attendants was prompted by the reports and studies that called for initiating proper training for flight attendants (Lecouturier, 1999; Rhoden *et al*, 2007; Mahony et al, 2008; Bani Salameh et al, 2009, 2010a, 2010b;). Systematic design of instruction can lead to improve learning outcomes (Dick and Carey, 2001; Frisby & Day, 2003; Johnson, 2009). In this study, a systematic interactive multimedia instruction (SIMI) was developed to enhance expertise of safety knowledge and skills (SKS) among flight attendants. Bransford, Brown, and Chocking (2000) referred to three main approaches that help learners develop expertise: (a) meaningful learning and patterns, (b) organizing knowledge within a main domain, and (c) storing a large amount of knowledge about this specific domain. The use of multimedia, with its capabilities in providing text, sound, video, simulation, interactivity and animation in addition to adopting proper theory and systematic design of instruction could cater for the approaches that develop expertise or mental models (Johnson, 2009). Thus, the improvement of the SKS among flight attendants might be achieved through making use of computer-based training (CBT). This research makes use of Gagne's theory and Dick and Carey instructional design model in designing systematic interactive multimedia instruction for flight attendants.

Literature review

Bani-Salameh, Z., Kabilan, M. & Bani-Salameh, L. (2010b) designed the in-flight safety assurance (ISA) model (Figure 1) based on the general systems theory (Von Bertalanffy, 1962) which describes flight attendants current practice in all major airlines in terms of safety knowledge and Skills (SKS). The ISA model dictates that the desired and ideal outcomes of expertise result from direct and indirect interactions, or cause-and effect relationships, among specific modifiable factors. It takes a holistic view, connecting key developmental opportunities over time. Basic safety training, pre-flight briefings and recurrent training are the primary inputs;

routine in-flight preparedness and Expertise flight safety schema are the outputs. The normal flight duty loop in ISA model represents the dominant flow of cognitive tasks; flight attendants enter this loop only after demonstrating initial mastery of SKS, and with the airline's cabin safety manual at hand as their guide to SOPs and emergency procedures. The normal flight duty loop and routine experience also represent the state of in-flight preparedness; they are a “standby mode” in which flight attendants are expected to be fully alert and vigilant. As safety practitioners, flight attendants also are expected to continually read their manuals and rehearse the emergency procedures in their minds, too often without adequate learning support except for the recurrent training. The In-flight Safety Assurance model provides a holistic view of the quality assurance processes from initial training to refresher training and a closer look at the safety knowledge and skills (SKS) by the flight attendants in the various stages of their career. The factors of the ISA model represent the conceptual framework and the ideal practice of the flight attendants work routines in all major commercial airlines.

The ISA Model (Figure 1) consists of three loops: the duty loop, the certification loop and the management loop, with Expertise as a hypothesized outcome from the iterations within the loops. The first loop which is the focus in this research is called Flight Duty Loop, which includes PFB, IFP and the development of Expertise Schema. The Flight Duty Loop is repeated approximately 10 times per month for twelve calendar months. Refresher training (RT) makes the second loop in ISA model, which includes RT, pre-flight briefing (PFB), in-flight preparedness (IFP) and Expertise. This loop is called Certification Loop because the flight attendants have to pass the refresher training (RT) in order to renew their annual competence certificate.

There are 3 avenues to acquire expert schemas, namely, through successful routine in-flight experience, through emergency experience, and through refresher training

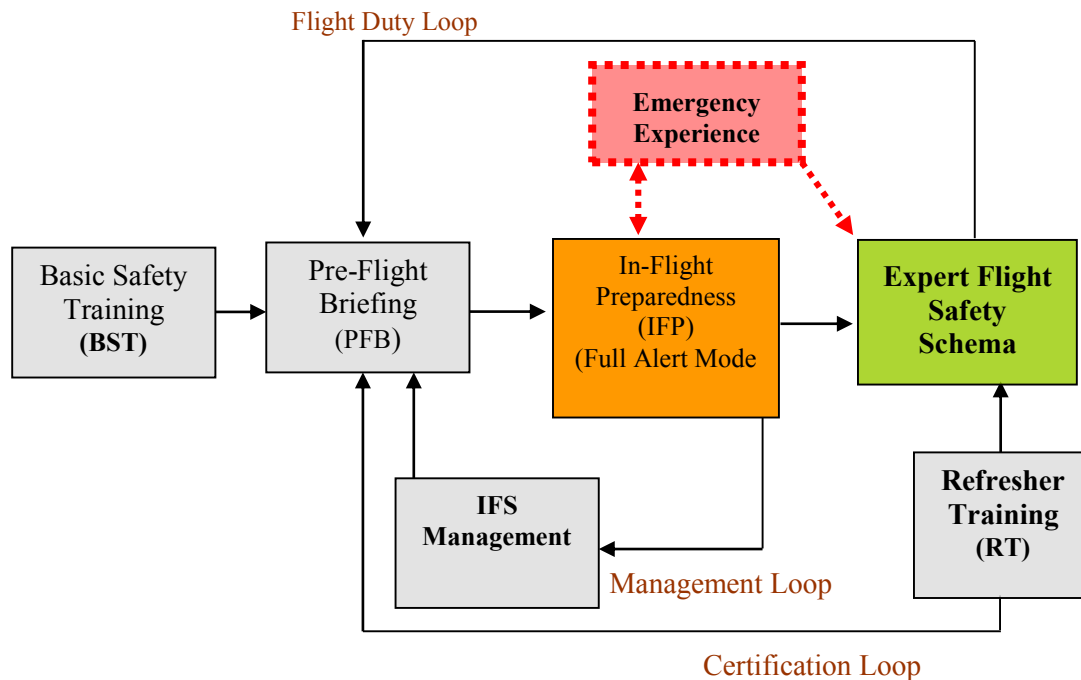


Figure 1: In-Flight Safety Assurance Model by Bani Salameh et al, 2010

Flight attendant training includes safety training, security training and crew resource management (CRM) training both in basic training and the refresher training (Jordan Aviation Training and Simulation). Despite the fact that flight attendants go through CRM in the basic safety training

and refresher training, there are still reports of flight attendants deficiencies. For example, 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 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 needed attention (Rhoden et al, 2009; Mahony et al, 2008, Rosenkrans, 2006 and FSF, 2005).

A study by Bani-Salameh, Z., Abbas, M., Kabilan, M., Mei, L. & Bani-Salameh, L. (2009) revealed that the flight attendants and supervisors reported surprisingly low perceptions towards all the ISA factors. One of the findings was that flight attendants who experienced onboard emergencies and successfully solved the emergency situations improved their perceptions of the usefulness of the safety manual, the importance of PFB, and continuous mental practice and rehearsal. These findings showed that among flight attendants, experience was the better teacher and the safety knowledge and skills as well as the procedures to establish and maintain the SKS became meaningful and fully appreciated only after experiencing real-life emergencies. This is a very expensive and risky way of maintaining expertise (Cited in Bani Salameh et al, 2010a). The low levels of perceptions and the uneven distribution of focus and confidence reported in this study should be seen as indicators of poor training or more accurately of poor maintenance of safety knowledge and skills (SKS) among the flight attendants. These findings can be interpreted as calls for help by the flight attendants and should be attended to immediately to avoid more negative findings such as reported by Mahony *et al* (2008), Rosenkrans (2006), FSF (2005).

The findings of previous studies suggest that although flight attendants were trained and annually recertified to perform the safety procedures, the training and other activities that they underwent in the course of their careers were fragmented and focused on specific skills and behaviors, but not on the integration of safety knowledge and skills (SKS), nor for the development of Expertise schema (Cited in Bani Salameh et al (2010a). Therefore, this research started with development of SIMI in order to measure:

- 1- If the SIMI package meets the USE questionnaire requirements.
- 2- If the SIMI package is effective in enhancing intellectual skills at the levels of rules and higher order rules.
- 3- If the SIMI package improves performance in all intellectual skills category.

Methods

Participants

The population of the study is 700 flight attendants working in Royal Jordanian airline. All are certified flight attendants with a minimum of one year flying experience. 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. This study used pilot testing based on 28 flight attendants for formative evaluation and other 70 flight attendants, for summative evaluation, who studied the systematic interactive multimedia instruction (SIMI) package before the flight.

Instrument

This study included one instrument developed by the researcher, namely an achievement test based on task analysis (Figure 3) of Gagne's two domains of learning of verbal information and intellectual skills. 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 analyzed for discrimination index and difficulty index before the achievement test was finalized.

Duration of instruction

The instruction took place at the crew center of Royal Jordanian airline. The instruction lasted for three hours and forty minutes in eleven sessions for one month. The instruction was within the normal work routines of flight attendants. For formative evaluation, the instruction was under supervision of the first researcher and for summative evaluation, the instruction was under supervision of in-flight supervisor.

Validation of the SIMI package

The author of this study designed and developed systematic interactive multimedia instruction (SIMI) using Flash CS3. Two English language experts assessed the appropriateness of the language. Six managers from, in-flight services validated the SIMI package.

Procedure of the study

As part of formative evaluation, 28 flight attendants studied the package and answered the achievement test under the supervision of the first researcher. Then, reliability of the test was calculated using Spearman-Brown Coefficient available in the SPSS software. The test items were also analyzed for discrimination index and difficulty index before the achievement test was finalized. To test the effectiveness of the SIMI package, a usability questionnaire was used to investigate 28 flight attendants opinions on content, usability, ease of use and satisfaction. After that, as part of summative evaluation, 70 flight attendants, chosen randomly, studied the SIMI under supervision of the in-flight supervisor and answered the achievement test.

Current practices in training flight attendants

In light of the ISA model presented above, flight attendants training is based on two practices. The first one is based on the text based reference of the Safety manual (Royal Jordanian, 2007). The second one is based on the training received at the training center which solely depends on PowerPoint presentations in addition to some sort of aircraft description (Jordan Aviation Training and Simulation). These practices do not make use of procedural interactive multimedia presentations as proposed in this research.

Development of the Systematic Interactive Multimedia Instruction (SIMI) package

The systematic interactive multimedia instruction (SIMI) courseware in this research includes three lessons on in-flight emergency procedures onboard commercial aircrafts. The instructional lessons are entitled "Cabin Safety Training". The lessons include "Planned Emergency," "Fire Fighting," and "First-Aid" situations of fainting, unconsciousness and burns. Flash CS3 application software was used in the development of the lessons. The first researcher in this study designed the lessons and developed all the individual parts of the lessons that represent the entire objectives and clusters of objectives according to the instructional analysis chart (Figure 3) that follows Gagne's hierarchical learning.

This study follows the ISD model by Dick and Carey (2001), which provides a step by step approach in creating and improving lessons. An instructional designer does not necessarily have to follow each step in detail but it depends on the needs required (IEEE, 2001). The following steps that represent Dick and Carey Model are adopted in designing the systematic interactive multimedia instruction (SIMI) in this research:

1. Identify instructional goals
2. Conduct instructional analysis
3. Identify entry behavior
4. Write performance objectives
5. Develop criterion-referenced test items
- 6- Develop instructional strategy
- 7- Develop instructional material
8. Design and conduct formative evaluation
- 9- Revise instruction
- 9- Design and conduct summative evaluation

The first step in the systematic instructional design is to identify the goals that refer to the desirable state of affairs. At this stage, the instructional designer has to identify what the learner will be able to do at the end of instruction (Dick & Carey, 2001; Frisby & Day, 2003). The instructional goals can be identified by conducting a needs analysis to determine the gap between the current situation and the desired outcome or ideal situation (Dick & Carey, 2001). In this research, because the core duty of the flight attendants onboard is safety, Bani Salameh *et al* (2009, 2010a, 2010b) shed light on instructional needs of the flight attendants to study through meaningful CBT instruction.

The second stage is instructional analysis refers to the component skills required to perform a task as in a task analysis or procedural analysis. Task analysis requires specifying learning in terms of the five domains of learning: verbal information, intellectual skills, cognitive strategies, attitudes and motor skills (Gagne, 1968, 1977, 1992). Task analysis in this research is based on Gagne's learning hierarchies and are associated with a number of intellectual capabilities such as *intellectual skills and verbal information* which are the focus of this research. The safety duties of the flight attendants are primarily categorized as procedural tasks or intellectual tasks. Learning hierarchies have ordered connections with each other and they require analyzing an objective into its subordinate constituents that lead to higher order rules (Gagne, 1968). Hierarchical learning starts with discrimination such as discriminating between normal call and emergency call from the cockpit and then moves to a higher level of concept such as NITES which represent a number of rules that lead to the solution of the problem and safe evacuation of passengers. Another higher level is rules then higher order rules. An example of rules is initiating emergency call from cockpit. A combination of rules divided into smaller chunks make up the higher order rules that lead to transfer of learning to new situations and problem solving.

To achieve the general goal and objectives set already, the researcher conducted an instructional analysis on three lessons adopted from the flight attendant in-flight safety manual of Royal Jordanian airlines. Figure 3 represents the task analysis of the lesson of planned emergency based on Gagne's two domains of learning of verbal information and intellectual skills.

The entry behaviors according to Dick and Carey (2001) can be determined based on the previous knowledge of learners. The flight attendants in this research have passed through the basic safety training (BST) and refresher training (RT) and they go through the duty loop of ISA model at least ten times a month. Therefore, they have substantial safety knowledge and skills that is supposed to cover entry behaviors. For example, flight attendants have the previous knowledge of the communication system as well as the electronic panels onboard.

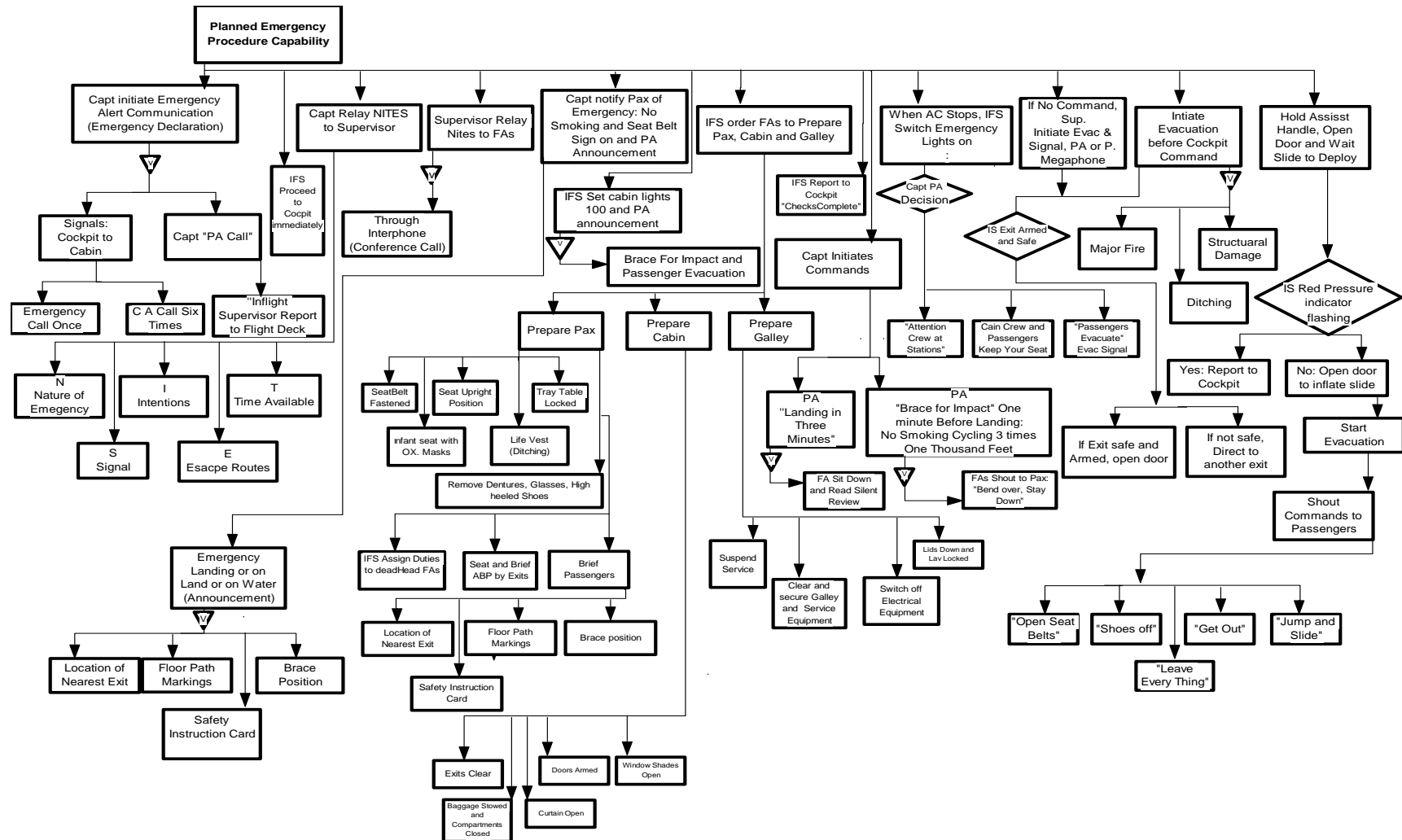


Figure 3: Task analysis of planned emergency according to Gagne's hierarchical learning

The goals refer to the general aims of the course. For example, the general goal of planned emergency lesson for the flight attendants is to be able to recall the safety knowledge and master the detailed emergency procedures for a planned emergency to achieve the terminal objective. Specific objectives are constituents of the terminal objective. They include preparing passengers, preparing the cabin and preparing galleys for emergency landing. Objectives specify what students will be able to do after finishing the instruction. Objectives in this research are written in light of the task analysis chart based on two of the five domains of learning by Gagne, particularly verbal information and intellectual skills.

Writing test items in this research is achieved in the context already set in the objectives. The purpose of test items in this research is to decide what the learner will be able to do at the end of instruction. That is, they measure attainment of the desired terminal objectives. Test items are based on objectives set previously based on the task analysis and content of a particular cluster

Instructional strategy is a framework for a plan to help learners attain the performance objectives. In this research, the instructional strategy is based on the Dick and Carey (2001) model. First, the first researcher, who is also the designer, sequenced and clustered the objectives. Verbal information is included within the cluster of intellectual skills to have meaningful learning and cater for shortcomings and fragmentation in the flight attendant in-flight safety manual and to avoid boredom. Flight attendants have previous knowledge of the safety knowledge and skills and they are certified flight attendants. Therefore, entry behaviors are not provided within the clusters, but the design will emphasize meaningful un-fragmented learning. For example, the first cluster in the lesson of planned emergency includes emergency declaration by the flight deck followed by relaying and acknowledgment of NITES (An appreciation of detailed procedure for planned emergency) by the IFS and then relaying NITES through conference call to the flight attendants. Second, each cluster in the systematic interactive multimedia instruction (SIMI) will be designed as one individual lesson based on the learning components that make use of Gagne's events of instruction to facilitate mastery of learning outcomes. The learning components in this research make use of both verbal information and intellectual skills out of the five learning outcomes following Gagne's hierarchies of learning. Gagne's events of instruction represent the learning components that are used in addressing each domain of learning:

1. Gaining attention
2. Informing the learner of the objective
3. Stimulating recall of prior learning
4. Presenting the stimulus
5. Providing learner guidance
6. Eliciting performance
7. Giving feedback
8. Assessing performance
9. Enhancing retention and transfer

The third component of this strategy will address computer based Training (CBT) as a delivery system to deliver instruction. After each individual cluster is prepared based on Gagne's events of instruction, the researcher, who is also the designer, assembled the individual clusters into the whole package. At this stage the interface (Home) was developed, which represents the main page of the program, to be interconnected with the individual clusters as presented in Plate 2.

Table 1 clarifies the use of the different components of intellectual skills and verbal information as it appears in the achievement test instrument:

Table 1
Test items distribution in verbal information and intellectual skills

No		Intellectual Skills				Verbal Information
		Discriminations	Concepts	Rules	Higher Order rules	
		Planned Emergency				
1					X	
2					X	
3					X	
4					X	
5					X	
6					X	
7				X		
8						X
9						X
10			X			
11		X				
12			X			
13			X			
14		X				
15		X				
16				X		
17				X		
18				X		
19				X		
20		X				
		Fire Fighting				
21						X
22		X				
23						X
24				X		
25			X			
26			X			
27				X		
28						X
29						X
30				X		
31		X				
32		X				
33					X	
34					X	
35					X	
		First Aid				
36				X		
37						X
38		X				
39					X	
40				X		
41		X				
42						X
43						X
44		X				
45		X				
46					X	
47					X	
48		X				
49					X	
50					X	
Total		12	5	10	14	9

Features of the Systematic Interactive Multimedia Instruction (SIMI)

Access

After clicking on the Flash icon on the Desktop, the flight attendant must enter his name and ID number to access the program as presented in Plate 1.

Plate 1: Log in Page

Interface

When the flight attendant starts the program, the Home page of the SIMI will appear with introductory demonstration as in Plate 2. During the introductory demonstration, flight attendant can skip to the introduction.

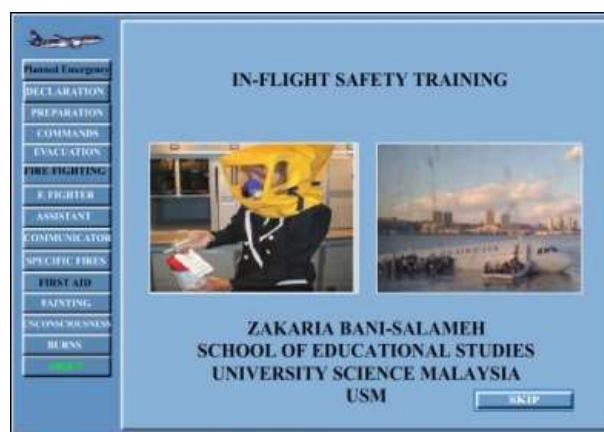


Plate 2: Home Page

After the home page, the introduction will appear as in Plate 3.

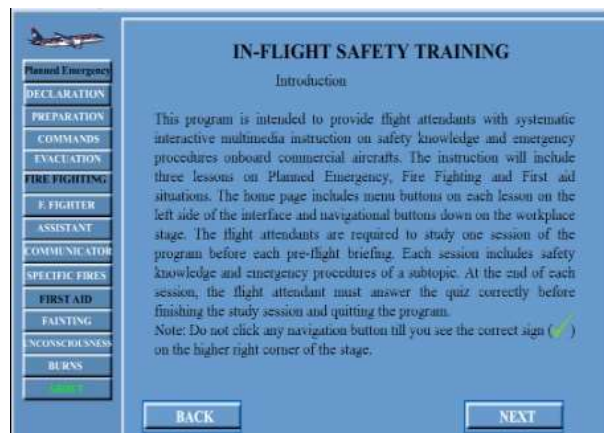


Plate 3: Introduction

After the introduction comes the general goal of the program as in plate 4.

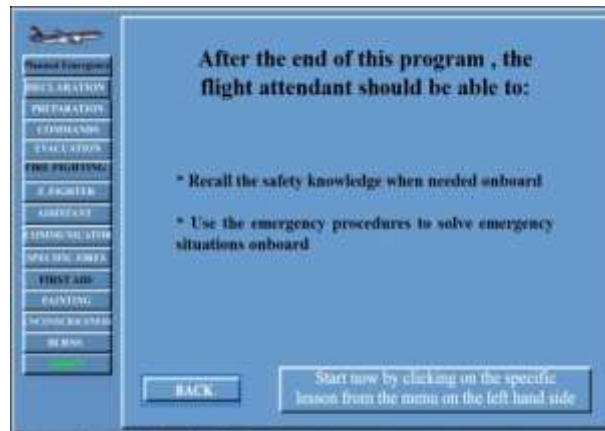


Plate 4: General Goals

Clicking on any topic in the menu will start a particular lesson that goes through the first seven events of instruction (Gagne, 1992). The following is an example of one cluster of "Emergency Declaration" in the lesson "Planned Emergency" using the seven events of instruction. According to Gagne's first event of instruction is that flight attendants attention should be attracted as in Plate 1.1.

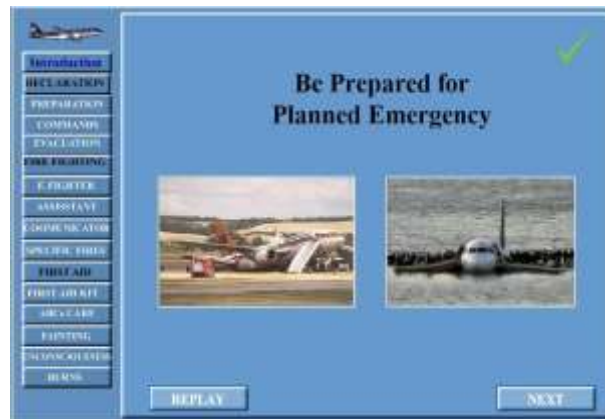


Plate 1.1: Attracting attention

The second event of instruction (Plate 1.2) includes informing the flight attendant of the objective. The objectives in each cluster should refer to both verbal information and intellectual skills.



Plate 1.2: Objectives

The third event of instruction (Plate 1.3) includes stimulating recall of prior knowledge. In this example the flight attendants will be informed of the prior knowledge of the cockpit panel, A320 layout and the Area Call Panel (ACP).



Plate 1.3: Prior knowledge

The fourth event of instruction is presenting the stimulus or the material. The example in this section refers to "Emergency Declaration." Plate 1.4 gives an example of the one part of the content or the stimulus.



Plate 1.4: Presenting the stimulus

The fifth event of instruction refers to proving learners guidance as presented in Plate 1.5:



Plate 1.5: Learners guidance

The sixth event refers to eliciting performance which comes in a form of questions as presented in Plate 1.6.



Plate 1.6: Eliciting performance

The seventh event of instruction used in this research is giving feedback as presented in plate 1.7.

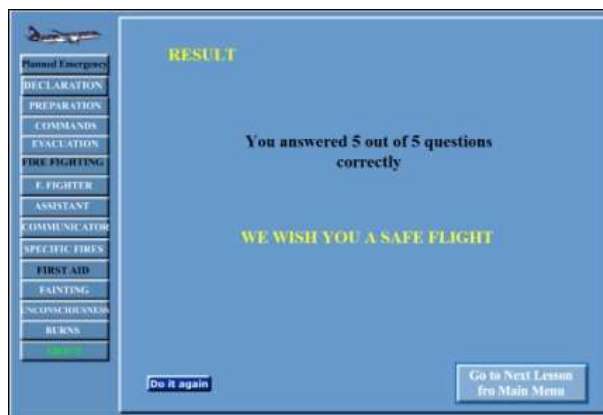


Plate 1.7: Giving feedback

The menus and buttons provided in the SIMI environment makes it easy for the flight attendant to navigate easily through the program and to repeat the lesson at his own pace. The menu buttons include home, back, next and replay. In addition, the video have special replay buttons.

The events of instruction adopted in this research provide a good deal of interactivity for the flight attendants. For example, the sixth event of “Eliciting performance” provides short quizzes within the cluster as in plate 1.6 and the seventh event of “Giving informative feedback.” presents immediate feedback which allows the flight attendants to interact within activities of the program (Plate 1.7).

Dick and Carey (2001) pointed out that three factors affect the use of media and delivery system; the first one is the availability of the material. In this research, the materials used for the systematic interactive multimedia instruction is based on the following sources:

Royal Jordanian flight attendant in-flight safety manual.

Materials provided by Royal Jordanian in-flight services department, in-flight product section and public relations department. Materials include videos and photos in-flight such as safety demonstration and cabin interior.

First aid videos obtained from Jordan Aviation Training and Simulation (JATS) training centre.

Design application software including Flash CS3, Adobe Photoshop CS3 and Adobe Flash CS3 encoder.

The second factor that affects the use of media is limitations in production and implementation. The SIMI makes use of multimedia and is designed using Adobe Flash CS3 design application software. The researcher designed and developed the material. Dick and Carey referred to the rough drafts, which are subject to revision, as intended to present a quick sample of the work for formative evaluation before developing the final expensive package. As for tools and resources used in developing the prototype, Dick and Carey pointed out that tools and resources require the use of technical as well as artistic skills. Therefore, the researcher designed a rapid prototype as a sample product used for demonstration purposes and for formative evaluation and revision. The researcher consulted people with instructional design experience for suggestions and recommendations with regard to the developed prototype.

According to Dick and Carey, the third factor is facilitation from instructor during instruction which must be defined before selecting or developing the material. In this research, since instruction is self-paced and makes use of the computers available at the crew center, each in-flight supervisor with his seven crew members studied the package before PFB through CBT.

There are two levels of formative evaluation in this research, one-to-one evaluation and small group evaluation. The program has been validated by supervisors from in-flight Services of Royal Jordan. The prototype was also presented to programming experts to identify technical problems and to instructional designers for recommendations on visual and audio content. The feedback was used to improve the program.

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

Results

A-Formative evaluation

1- Usability

A Usability questionnaire (Lund, 2001) was administered to the flight attendants to measure the ease, appropriateness and intuitiveness of the SIMI package. The factors evaluated were content, usability, ease of use and satisfaction (Table 2). The reported means for all the factors were all greater than 4.8 on the scale of 1 to 5. This indicated that the package has met the usability requirements and was easy and intuitive.

Table 2
Means and standard deviations of the usability test

	N	Minimum	Maximum	Mean	Std. Deviation
Satisfaction	28	4.25	5.00	4.82	.23
Ease of Use	28	4.20	5.00	4.80	.27
Usability	28	3.60	5.00	4.79	.31
Content	28	4.17	5.00	4.80	.25

Reliability of the cabin SKS 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. $r = 0.863$ was considered to be suitable for the purpose of this study (Gay & Arasian, 2003).

Difficulty coefficients

An analysis of the Difficulty index and Discrimination Index of the test items was conducted. Table 3 reports the difficulty indices of each item. The maximum index of difficulty is 100 per cent. Items falling below 33 percent and above 63 percent are likely to be too difficult and too easy respectively (Cohen, Manion & Morrison, 2005). For the current study, difficulty coefficients were ranged from 28.6 to 82.1 as shown in Table 5.2. From the table 12 items appeared to be in the too easy category but a check of the test item distribution table showed that they belong to the verbal information and the lower level categories of the intellectual skills. They are retained because they are necessary items in the hierarchy of intellectual skills and getting them correct does not guarantee successful application in the next level of the hierarchy. It was also found that all the 13 items (Q1, Q2, Q3, Q4, Q5, Q19, Q33, Q34, Q35, Q46, Q47, Q49, and Q50) reported as being difficult with less than fifty percent being able to answer correctly belonged to the Higher-Order Rule category.

Table 3
Difficulty and discriminability coefficients of the achievement test items

Item	Category	Difficulty	Discriminability
1	HoRules	.56	0.50
2	HoRules	.59	0.63
3	HoRules	.53	0.63
4	HoRules	.44	0.38
5	HoRules	.59	0.75
6	HoRules	.51	0.38
7	Rules	.74	0.63
8	VI	.77	0.25
9	VI	.74	0.50
10	Concepts	.73	0.50
11	Discrimination	.79	0.25
12	Concepts	.79	0.50
13	Concepts	.74	0.38
14	Discrimination	.76	0.38
15	Discrimination	.79	0.13
16	Rules	.67	0.75
17	Rules	.69	0.50
18	Rules	.73	0.50
19	Rules	.66	0.88
20	Discrimination	.77	0.50
21	VI	.74	0.50
22	Discrimination	.76	0.38
23	VI	.73	0.50
24	Rules	.63	0.25
25	Concepts	.75	0.50
26	Concepts	.73	0.13
27	Rules	.66	0.25
28	VI	.79	0.25
29	VI	.70	0.63

Item	Category	Difficulty	Discriminability
30	Rules	.77	0.88
31	Discrimination	.73	0.38
32	Discrimination	.71	0.50
33	HoRules	.49	0.25
34	HoRules	.54	0.25
35	HoRules	.47	0.25
36	Rules	.61	0.63
37	VI	.79	0.50
38	Discrimination	.74	0.25
39	HoRules	.63	0.88
40	Rules	.67	0.38
41	Discrimination	.76	0.25
42	VI	.73	0.50
43	VI	.79	0.38
44	Discrimination	.73	0.50
45	Discrimination	.73	0.50
46	HoRules	.46	0.13
47	HoRules	.46	0.75
48	Discrimination	.58	0.38
49	HoRules	.37	0.50
50	HoRules	.77	0.25

Item discriminability refers to the potential of the item in the question to be answered correctly by those students who have a lot of the particular quality that the item is designed to measure, and to be answered incorrectly by those students who have less of the particular quality that the same item is designed to measure. In other word, to check the effectiveness of the test item in showing up differences between a group of flight attendants and to enable us to discriminate between flight attendants' abilities in a given field. However, an item with high discriminability will give the opportunity to see a potentially wide variety of scores on that item; an item with low discriminability will show scores on that item poorly differentiated (Cohen et al, 2005). Item discriminability will be computed as follows:

$$\frac{A - B}{.05 * N}$$

Where

A= the number of correct scores from the high scoring group;

B= the number of correct scores from the low scoring group

N= the number of students in the two groups

The maximum index discriminability is 1.00. Items with index of less than 0.30 are considered to be too undiscriminating. Thus, it should be reviewed to find out whether this is due to ambiguity in the wording or possible clues in the wording. Items with limited discriminability and limited difficult indices will be notified or replaced.

After all, those items with the greatest discriminability and the most appropriate degrees of difficulty can be retained. Criterion-referenced tests have very low discriminability if all students achieve very well or achieve very poorly, but the discriminability is less important than the fact that the students have or have not learnt the material. A norm-referenced test would regard such a

poorly discriminating item as unsuitable for inclusion, where as a criterion-referenced test would regard such an item as providing useful information (Cohen, Manion & Morrison,. 2005).

For the current study, discrimination coefficients were ranged from 0.13 to 0.88 as shown in Table 5.3. From the table 12 items appeared to be in the low discrimination category and the test items were reviewed and improved.

The findings revealed that the most difficult items belonged to the category of rules and higher order rules and the presence of better supervision during the learning process generally improved the flight attendants' performance in all categories especially the rules and higher order rules. The average increment for the test items from the formative to summative evaluation were 0.15 or 15% for higher order rules, 0.13 or 13 % for rules, 0.034 or 3.4% for concepts, 0.077 or 7.7 % for discrimination, and 0.006 or 0.6% for verbal Information. This finding suggests that the SIMI package was effective in enhancing intellectual skills and at the levels of rules and higher order rules when administered under proper supervision.

Table 4
Performance on SKS and other inputs

	Formative evaluation (n=28)		Summative evaluation (n=70)		Mean Gain
	Mean	Std. Deviation	Mean	Std. Deviation	
Discrimination	8.00	2.404	10.03	1.18	+2.03
Concepts	3.64	1.22	4.57	.76	+0.93
Rules	5.57	2.63	8.96	1.04	+3.39
HO Rules	5.29	3.10	11.24	1.45	+5.95
Verbal_Info	6.75	1.99	10.04	1.36	+3.29

The findings indicated that performance of the flight attendants improved in two ways under supervision of the crew supervisors. The mean scores increased for all intellectual skills and increased by 1 point for concept to 6 points for higher order rules. Secondly, the standard deviation values for each intellectual skill were reduced to reflect consistency of performance.

Discussion

The package has met the usability requirements and was easy and intuitive which reflected the effectiveness of the Package (Lund, 2001). The SIMI suggests that the SIMI package was effective in enhancing intellectual skills and at the levels of rules and higher order rules when administered under proper supervision. Supervision is meant as a preplanning to assure readiness of flight attendants which could have enhanced flight attendants performance (Koreltz-Elliott, 1989). There are small and large differences between the pilot and posttest for the intellectual skills items. SIMI improved performance in all intellectual skills category and improved consistency of performance.

Conclusion

Summary and recommendation

Systematic design improved performance and consistency of performance, especially for problem solving. Gagne's hierarchical learning and events of instruction are recommended for designing training packages. The administration of the SIMI package must be under supervision of the management. This method should be developed to support continuous professional development (CPD) among flight attendants.

This paper does not make comparison with current methods of training because of the lack of these methods. Rather it proposes new approach of training flight attendants. Thus, due to the urgent need to improve the safety knowledge and skills training provided to flight attendants, this conceptual paper introduces systematic interactive multimedia instruction (SIMI) following the Dick and Carey model of systematic instructional design for training flight attendants just before they conduct their pre-flight briefing before each flight. This SIMI could be delivered through CBT and is based on the events of instruction by Gagne, which has been proved capable of transforming novice to experts.

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Editor's Note: This paper provides an in-depth analysis of problems and strategies to develop effective self-directed learners using social constructivist approaches in open distance learning.

Self-directedness in open distance learning: twists and turns

Bernadette Geduld
South Africa

Abstract

Learning is a complex process that has generated numerous interpretations and theories as to how exactly it can be effectively facilitated to ensure that accomplished and meaningful learning is attained. Teacher-centred teaching and learning has dominated much of education, particularly adult and higher education, for the past fifty years or more, but there has been an increasing number of requests to educators to make a paradigm shift from the behaviouristic approach to the constructivist approach of teaching and learning. This paper provides an opportunity for discussion on the value and challenges of social constructivist approaches and self-directed learning for open and distance learning (ODL) students and lecturers. ODL lecturers' and students' teaching and learning beliefs will have to be shaped according social constructivist approaches to develop self-directedness in students.

Keywords: open distance learning, demands, development, self-directed learning, self-regulation, strategies

Introduction

Learning is a complex process that has generated numerous interpretations and theories as to how exactly it can be effectively facilitated to ensure that accomplished and meaningful learning is attained. The task of translating learning theories into practical applications is not simple and straightforward. Teacher-centred teaching and learning has dominated much of education, particularly adult and higher education, for the past fifty years or more, but there has been an increasing number of requests, from proponents of constructivism, to educators to make a paradigm shift from the behaviouristic approach to the constructivist approach of teaching and learning (Brown, 2005:1; Vrasidas, 2000:339).

In South Africa, ODL is the only available mode for delivering professional in-service training and development to practising unqualified and under-qualified teachers across geographical distances. Teachers, especially in rural areas, avail themselves of this mode and opportunity to enroll and improve their qualifications. One large South African university offers distance education programmes for educators, through a second generation model with a social constructivist and blended learning approach that combines the use of printed media, limited face-to-face contact sessions at 55 study centres and interactive whiteboards, CD-ROMs, and mobile devices as part of curriculum delivery and student support. Additional student support is offered through vacation schools, tutorial letters, information booklets, telephonic assistance and email (Blignaut & Els, 2010:101).

Problem statement

Though much literature focuses on the value of the social constructivist theory and technology in ODL (Venter & Van Heerden, 2001:20; Schulze, 2009:992; Ferreira, & Venter 2011:80; Makoe, 2012:1) little research was done on the contextual factors of students in developing countries that inhibit the use of social constructivist teaching and learning approaches in ODL. Research on open and distance learning deals mainly with course design and instruction design (Vrasidas 2000:339; Schudel et al., 2008:543), dissemination and evaluation of educational material and the

impact and use of information and communication technology (ICT) when applying a social constructivist approach in ODL (Brown, 2005:1; Tshibalo, 2007:686, Esterhuizen, 2012:3; Tunjera et al., 201:574). Searches on journals and books have revealed that literature on ODL focuses mainly on challenges of ODL institutions to deliver quality education, the technological development, e-readiness, quality assurance, cost effectiveness and student support (Simpson 2012:105; Roberts, 2007:1; Mikropoulos, 2013).

Many ODL students struggle to meet the requirements of social constructivism which has many parallels with self-directed learning, namely for learners to be meta-cognitively, motivationally, and behaviourally active participants in their own learning processes. This situation can be attributed to the fact that a majority of students, especially those from disadvantaged backgrounds, find it difficult to succeed in ODL (Makoe 2012, 65). Students' inability to apply social constructivist approaches and students who are less self-directed result in poor pass rates and declining graduation rates in higher education (Higher Education and Training, 2012). Students who are not successful the first time around and only pass after a second or third examination, are terminated, or drop out. Academic success in ODL can be improved if ODL institutions know and understand more about students' and lecturers' abilities to function in social constructivist approaches and blended learning and how to develop students' self-directed skills in ODL.

Against the dearth of research on pedagogic issues and contextual factors of students in developing countries that inhibit the use of social constructivist teaching and learning in ODL the following questions arose:

What are the challenges of teaching and learning in a social constructivist approach in the specific ODL context of BEd Honours students at NWU?

Are students' self-directedness sufficient to function with a social constructivist paradigm within ODL?

What support can be offered to enhance self-directedness and overcome the challenges in social constructivist teaching and learning?

Research orientation

The research was approached from a pragmatic, post-positivist worldview which is based on context driven and practical views best suited for the specific research aims of this study, namely to reflect about a real world problem and to improve practice (Gelo, Braakman and Benerka 2008: 278) The reason for choosing a pragmatic research paradigm is because it provides a workable solution to the multifaceted research problems and research questions above and offers a practical, "*middle ground*" orientation in relation to postpositivism and interpretivism (Johnson & Onwuegbuzie, 2004:17,18).

In this study the author will reflect on the challenges of ODL teaching and learning in a social constructivist teaching and learning approach where ODL is delivered in a second generation model. The methodology here is twofold: Firstly, a description of the development of ODL and its demands and challenges are offered. Secondly, by drawing on literature texts concerning social constructivism, self-directed learning, self-regulated learning and its interrelatedness, the author reflects on contextual challenges for teachers and students.

Reflections in this chapter offer insight to ODL lecturers in developing contexts as to what can be expected and to become aware and proactive in developing their teaching strategies and technological abilities. ODL in developed contexts, on the other hand, could compare these experiences with their own contexts to explore the impact of development.

In the following sections the theoretical conceptual framework will be offered and recommendations be made to foster self-directedness and social constructivist approaches in ODL.

Theoretical conceptual framework

Open distance learning

Wang and Kreysa (2006:3) and Littlejohn et al. (2007:228) define open distance education as a form of education with the characteristics of a physical distance between the teacher and the students, an organised teaching program, and the use of technological media and two way communication.

With the development of ODL in recent decades, technology became a powerful tool in effective ODL delivery. Anderson (2009:81) poetically describes the essential combination of pedagogy and technology in ODL where “the technology is the music setting the tempo, the beat and the timbre and compelling melodies and pedagogy defines the choreography, directing the dancers’ sweeping motions, graceful extensions, and enduring embraces.”

Various reasons are cited in the literature for the development of ODL in higher educational institutions, for example the dramatic growth in students beyond 18-24 years of age who need university education, realization of the need for lifelong learning, women returning to the labour market, a population of workers who have already retired and have had to be retrained for new careers, a response to national educational needs of communities, and countries’ economic needs (Williams & Goldberg, 2005:725). Technological communication and the Internet in the twenty-first century influenced the nature of learning, and the learning styles of ODL students creating challenges for both lecturers and students in ODL.

The change in the perception of distance learning as low-status education and increasing confidence in ODL teaching methods in the education sector has also resulted in ODL institutions focusing on flexibility in delivery modes. Another related international trend is that the students are viewed as customers (Lai et al 2003). ODL institutions had to adapt their programs and delivery methods, and had to improve programs to meet the learning needs of diverse customers. ODL institutions also had to adapt from teacher-centered to constructivist teaching and learning methods such as interactive learning, problem solving, practical experience and computer-mediated communication (Rumble, 2001:18). These changes led to the development of more sophisticated interactivity in asynchronous models of distance learning and consequently to greater access for many students. Researchers like Taylor (1995:2) and Zuhairi (2006:95) distinguish between these specific delivery modes and features as different generations of ODL.

Generations in open distance learning

The first generation, the correspondence model, is based on the assumption that knowledge can be transferred by teaching and is characterized by the use of the printed word. (Willems, 2005:718). The printed word in the form of detailed, written information, prescribed books and articles for students to study independently (Capa, 2003) is beneficial for students without electricity and electronic technology at their disposal (Ascough, 2002:17). This model's advantage is its adaptability to learners in their own time and place and the opportunity to pace their own learning. Students can easily move printed study material for use. The disadvantage is the lack of one-on-one interaction between the student and the educator that gives rise to feelings of isolation among learners (Taylor, 1997:2; Willems, 2005:718). A further disadvantage is that the mail and transport can be slow or unreliable system and thus feedback on assignments can be delayed (Willems, 2005:718).

The second generation or multimedia model is sometimes described as industrialized (Taylor, 1997:2). The delivery technology of the second generation distance learning is an integrated

multi-media approach in which written material, video broadcasts, and computer-based learning are included. The multimedia model is adaptable for time, place, and pace of distance learners' studies (Bates, 2005:7).

The third generation or the tele-learning generation is described as knowledge-based or post-industrial. It characterizes a constructivist teaching approach with dialogues and discussions among students and web-based administrative services (Bates, 2005:7). This generation focuses on the interactivity between the educator and students using audio teleconferences, video conferencing, audiographic conferences, television and radio (Taylor, 2001:3). This model offers the advantage of quick feedback on assignments which are made possible by the Internet and students who can communicate with other students to motivate one another or even to have social conversations. Although the interactivity between the educator and learner and communication between students increases, the disadvantage of this delivery is that it is not flexible regarding time, place and pace for students who do not have access to technology or who lack technological skills, because these learners are excluded from the learning process.

The growth in popularity of the Internet and its e-mail and data storage and recycling capacity has led to a fourth generation of distance learning, namely the flexi-learning model. This fourth generation is characterized by the development of computer-based communication, on online delivery via the Internet and combines the advantages of high-quality interactive multimedia with access to a range of teaching resources (Taylor, 1997:2; Lai et al., 2003:4). The delivery technology is interactive media that allows the student to communicate with other students if the student is physically separated from the educational institution (Taylor, 2001:3). Changes in technological communication that are used in this model have influenced aspects such as the type of study material, communication and interaction between the lecturer and students and communication amongst students themselves. The general effectiveness of ODL (Zhoa et al., 2005:1862) can be seen from the advantages of sophisticated, interactive multimedia and specially developed printed materials, audiotapes, videotapes, and computer aided teaching packages aimed at improving concepts and cognitive skills of students.

The fifth generation of distance learning, known as the intelligent flexi-learning model, focuses on interactive multimedia, Internet-based access to the global site, and computer-based communication. This model is characterized by automated response systems to access the organization's institutional processes to get information (Taylor, 2001:3) and offers the same benefits for students as discussed in the third and fourth generation. Taylor (2001:3) sees the model as intelligent because it further benefits automation of administrative and academic learner support systems. The distance learning institution, as well as ODL students, can benefit in terms of the cost of access to the institution, online delivery of courses, saving time and flexibility of place and pace of study.

As with all previous generations, the fifth generation also has shortcomings. Williams (2005:721) lists the following problems experienced by this generation of distance learning: the download speed of the Internet is sometimes slow, frustration is sometimes experienced with power outages cutting off the student's Internet provider or the institution's Internet provider, computers with insufficient memory components to download online documents, and hidden costs associated with downloading and printing course work.

The demands and challenges of ODL

The different generations create different demands on ODL students. All generations require that students are self-directed and possess self-regulating learning skills. There is a lack of conceptual clarity in the literature about the definitions of self-directed learning, self-regulation and meta-cognition (Kaplan, 2008:477). Sometimes these concepts are used as interchangeable concepts, and at other times they are viewed hierarchically within each other (Dinsmore, Alexander, &

Loughlin, 2008: 392. In this article self-directed learning (SDL) is seen as the broader or umbrella concept which includes self-regulated learning and metacognition.

Loyens et al., (2008:411) define self-directed learning as a process in which the student takes the initiative and responsibility for setting his own learning goals, identifying and addressing gaps in his learning, identifying resources, selecting and carrying out learning strategies and evaluating his own learning. The literature shows that the concept of SDL embodies many crucial factors connected to students' responsibility and independence in learning. SDL as a concept was popularized (Knowles 1975:18), and has been more thoroughly examined within the tradition of adult education (Guglielmino, 2008:3; Silén & Uhlin, 2008:461).

The importance of self-directed learning is emphasised by the necessity to develop not only students' subject knowledge but also higher order thoughts and reasoning, critical thinking skills and lifelong learning to prepare them to function in a changing world. A new approach to learning is needed where the focus is not on the amount of information students learn, but on the process of learning.

Literature indicates that a positive relationship exists between self-directed learning and academic achievement (Vrugt & Oort, 2008:124). The ideal ODL student applies self-directed learning to achieve academic success. ODL students' self-directedness can also be measured according to the degree that they can handle the requirements of ODL as a mode of delivery.

Self-directed students are pro-active in their efforts to learn, because they are aware of their strong and weak points or limitations. By setting personal learning aims, using learning strategies appropriate to the specific learning tasks they have to complete and monitoring learning activities in terms of their learning aims, self-regulated learners determine whether they have achieved the outcomes.

Self-regulated learning refers to the process in which a person is metacognitively, socially, motivationally and behaviourally active in his or her own problem-solving processes using self-observation, self-judgment and self-reaction to attend to information; plan and manage time; process, integrate and organise knowledge; code and rehearse information to be remembered (that is, invoke metacognitive skills); maintain a positive sense of self-efficacy; establish a productive work environment; use social resources effectively and experience a positive anticipation about the potential outcomes of learning new information (Zimmerman, 1989: 329; Zimmerman, 2000:2. Self-regulated learning can be viewed from behaviouristic, phenomenological, Vygotskian, cognitive-constructivist or social-cognitive theoretical perspectives.

Self-regulated students possess superior motivation, high levels of self-efficacy, and the ability to create social and physical environments in which they can learn and which enable them to do well academically. These learners also possess good metacognitive knowledge and control which include effective planning, organisation, and evaluation of their learning tasks.

Metacognition is primarily concerned with the nature of cognitive processes, whereas the primary focus of self-regulation is human behavior and its interaction with the environment (Dinsmore et al., 2008:392). Barzilai and Zohar (2014:14) define metacognition as a complex and multifaceted concept that entails several types of knowledge, skills of self-regulation, control, and affective experiences. Metacognition is usually defined, following Brown and Flavell, as knowledge about cognition and as regulation of cognitive activities (Brown, 1978:77; Flavell, 1979:906). Processes of regulation and control of cognition involve planning, monitoring, and evaluation of the nature of the individual's knowledge, as well as of strategies and processes of knowledge construction and justification, as epistemic metacognitive skills.

Self-directedness refers to students being in control of their studies and applying self-regulated and metacognitive processes such as planning, goal-setting, task analysis, monitoring and

evaluation and reflection of their own progress during the execution of tasks. It furthermore requires that students be able to manage their time and to work independently, be able to manage personal stress, possess motivation for the task at hand and to persist ODL students must also have the abilities to overcome the barriers presented by non-mother tongue education, to seek information from different sources and to create a positive learning environment for optimum study. From the second generation on, possession of skills in information technology and interaction in ODL is required. According to Anderson and Dron (2011:81) "it is notable that the social-constructivist approach gained foothold in ODL when the technologies of many-to-many communication became widely available by emails, bulletin board and later through the World Wide Web and mobile technologies". Students must meet all these demands and many others in the face of the isolation caused by geographical separation and lack of contact with fellow students and lecturers.

Teaching these students in a social constructivist approach holds challenges and barriers for students as well as for lecturers.

A social constructivist approach

Essence of the social constructivist approach

The social constructivist theory views learning as a social phenomenon and personal interpretation of the world in which knowledge is constructed from real life experiences, prior knowledge, and the activities students engage in as they learn (Bartos, 2007). When knowledge is constructed students develop meaning on the basis of experience and use what they already know about a topic to interpret new information. Learning is also an active student-centered process in which conceptual growth comes from the negotiation of meaning, the sharing of multiple perspectives, and the changing of internal representations through collaborative learning (Kiely, 2004:20). One's understanding comes through understanding, experience, interactions with others, and various sources and reflection (Lewis, 2009:38). In the social constructivist approach essential skills like speaking, arguing, resolving conflict, and use of higher order cognitive skills are developed. Because students are able to interpret multiple realities, they can deal better with real life situations. If students can solve problems they may better apply their existing knowledge to a novel situation.

Shortcomings of social constructivist approaches

The social constructivist theory silently assumes that all students are evenly responsible, self-directed, and possess metacognitive skills to control their own learning. The challenge is to teach this approach to less self-directed ODL students who lack the ability to determine the learning needs and strategies required for their academic progress. Critics warn that with the application of this theory's teaching principles, too much emphasis is being placed on active and self-directed learning and the guidance and scaffolding that many students need are not taken into account (Liu & Matthews, 2005:391; Driscoll, 2005:399). Another shortcoming is experienced when students have to complete tasks that require various resources such as direct experience, secondary sources, research, and interviews; sometimes the overload of information confuses them when they have to distinguish between relevant and irrelevant information (Venter, 2001:91). Social constructivist approaches are also problematic in situations where consensus is required and it cannot be reached easily because each student has his or her own unique reality in his or her own thoughts, especially in a multi-cultural country like South Africa. The social constructivist theory is also criticized as subjective because social interaction and collaborative learning is overemphasised, whilst the role of the individual student is deemphasised. This theory has very challenging teaching implications because not all lecturers are familiar with the theoretical and philosophical foundations of social-constructivism.

Profile of the ODL students

The students in the BEd Honours programme at the North West University are mostly female, middle aged, older than forty years and married and have received primary, secondary as well as initial teacher training completed during a period where the emphasis was on teacher-centred traditional approaches and not on self-directed learning in constructivist teaching and learning approaches. It is therefore not surprising that many of these students still expect and rely on direct teaching and contact with lecturers.

Many of these students (71.6%) study in their second or third language; consequently English as the language of instruction has implications for learning since the study material is only available in English and Afrikaans and they have poor English language proficiency (Geduld, 2011:220). The students view English as the language of instruction as a barrier in their studies. Despite the high rate of computer literacy among students, many indicated in personal conversations and in previous research that they do not have access to the Internet at home. Although some students could possibly have Internet facilities in the areas they live, as indicated by literature (Ferreira and Venter, 2011:88) and judging from conversations and the large number of handwritten assignments the tutors receive, some still experience problems with access, costs, and the use of technology. It is clear that despite the rapid development in ODL delivery, the North West University is still hampered by social, economic and cultural contexts of their ODL students.

An important contextual aspect is the unfavourable conditions in which students in rural areas study. Many students share two-bedroom houses with other adults and children, which lessens privacy and favourable study conditions. Often there are no schools or libraries that can serve as possible study places.

The problem of isolation

Croft, Dalton and Grant (2011:18) explain isolation in terms of dimensions as time (concurrent study), space (geographical dispersion), social (awareness of others), intellectual/experience (academic ability and life experiences) profession (subject related Expertise); ICT knowledge; sensory (ability to see/feel/hear peers). Psychological isolation may result from the physical and temporal isolation experienced by learning at a distance.

Time isolation refers to isolation experienced when students are the only ones studying a specific course at a specific time. Many students experience this isolation when there are no other students enrolled for a specific module at the same time. Students may feel as if they are the only person doing the course, which may be correct given the geographical location of the student. Time isolation hinders the social presence required in ODL and a social constructivist approach and learning over a distance is then experienced as a lonely, individual process.

Geographical isolation and lack of awareness how to contact other students cause frustration and is frequently reported by students in the BEd Honours program. Despite initiatives of the North West University to bridge the distance between lecturers and administration staff the absence of interaction with lecturers and other students in the learning environment remain a main barrier for many ODL students because of access to technology or absence of technological skills. The social and active process where students need collaboration and interaction with other people becomes problematic when students lack the educational experience of interaction to share ideas, clarify uncertainties, and learn from one another (Anderson & Dron, 2011:85). In the context of the students in this program it is worsened by students' poor English language proficiency that inhibits them from asking questions in class and over interactive whiteboards as well as taking part in discussions.

For lecturers the physical and social isolation complicates the design and use of group assignments, group discussions, cooperative learning experiences, hands-on field experiences,

real-life problem-based activities and other active learning strategies. It is only at the limited, non-voluntarily face-to-face contact sessions where group discussions and cooperative learning experiences can be applied and where students are able to compare notes with other students, exchange ideas with others and gauge their reactions, and listen to what others are thinking in order to compare it to their own ideas. Peer reviews of work cannot be set up to encourage further thinking because of the limited time on the timetable for each module. Active learning implies active engagement which is characterized by interaction with lecturers and other students; talks and discussions where students can come up with new ideas and test out new ideas in the workplace to bring about personal growth (Amstutz, 2009:32). In ODL limited active engagement is taking place.

Technological isolation refers to challenges for many students when there is limited or no access to Internet, electricity and telephone networks. Where these do not exist, students do not possess and cannot utilise information technology skills and do not have expertise in using computers to search online resources. This type of isolation is frequently experienced by students in rural areas at the North West University.

Sensory isolation refers to the level of communication individual students prefer. Most students in the BEd Honours programme prefer face-to-face contact with other students and lecturers because the inability to experience either people or places first-hand is a particularly difficult issue for them (Van Zyl et al., 2013: 92). While communication via electronic media can be encouraged, for many students it does not completely replace hearing a human voice or seeing another person. Many students prefer synchronous interactivity because it creates an intimate learning environment and contributes to natural, social contact that is an important requirement for adult learners. Humanising the ODL courses is thus considered an important element to increase the social aspects of interaction.

Intellectual or experience isolation refers to students who feel isolated by their intellectual or academic experiences and limited prior knowledge. The diversity of ODL students' backgrounds means that although different students undertake a course or are from the same teaching profession, their levels of knowledge and experience might be very different. It has been noted by many ODL lecturers that these students with limited prior knowledge and experience cannot relate new material to what they already know, and therefore tend to memorise rather than develop any real understanding of the content in their courses.

Real life experiences and prior knowledge play a pivotal role in social constructivist learning. The teaching implication here is to learn about your students' experiences, preconceptions or misconceptions by using pre-tests, background knowledge probes and written or oral activities designed to reveal students' thinking about the topic. This teaching strategy is not possible with the limited contact lecturers have with their ODL students. Cretchely and Castle (2001:494) furthermore warn that many learning theories put too much focus on the importance of experience to learn and do not to keep in mind that the quantity of experience is not necessarily equal to the depth, richness and intensity of experience. Individuals can, for example, have many years experiences from which there is not necessarily good, relevant knowledge and skills (Brookfield, 1995). Experience can also be an obstacle if ODL students' previous teaching and learning experiences are characterized by passive learning. Such students prefer and expect the traditional teacher-centered teaching approach. If they are not taught according to the traditional teacher-centered approach, they become frustrated and negative, especially the students who have not been involved with formal studies for a long time (Gravett, 2004:8). Many adult learners' learning are unstructured and need much advice and guidance, because they are easily distracted by their own needs, assumptions, values and misconceptions when they must work independently, have little self-confidence, and do not have the necessary resources to learn independently (Conlan et al., 2008).

Contrary to existing literature, experience with ODL students' indicates that they seldom use self-directed learning skills such as task analysis, goal setting and strategic planning. Many students do not meet the requirements to work confidently, independently and self-directed with well-structured learning material and less support from lecturers. Students' cognitive readiness for SDL and constructivist learning approaches, their own self-efficacy regarding their critical thinking abilities, their expectation of direct instruction where lecturers provide intellectual and scholarly leadership and share their subject knowledge. Their limited proficiency in English as academic language hinders questioning from students, inhibits their participation in discussions, and present challenges for the development of self-directed learning.

Many students rely more on external regulation from lecturers and peers and not on their self-directed learning skills to achieve academic success (Geduld, 2011:279). External regulation is a form of support where educators compensate for students with poor self-directed skills, and because of maximum external support students do not experience first-hand the benefits of self-directed and self-regulated learning skills to develop as lifelong learners.

This use of peer learning is ineffective and in contrast to the requirement that ODL students must have the ability to work independently. On the other hand (Makoe, 2012, 73) argues from an African perspective that in most African cultures, reliance on peers and group interaction is a strong factor determining values and social interaction. Learning in support groups is rooted in cultural beliefs and practices. The challenge is evident that some students find it difficult to step out of their own culture of learning and to enter into the culture of ODL institutions where independent learning is required. Peer learning is more effective when students work independently and thereafter share ideas, strategies and opinions with peers to master the subject content and to gain deeper insight in the knowledge (Geduld, 2011: 251).

Recommendations

Many lecturers complain that students are not self-directed learners, but they fail to recognise the impact that their own courses have on cultivating those lifelong learning skills (Nantz & Klaf, 2012:1). Classroom experiences, assignments and modules that are carefully constructed can help students to develop and to step into new roles as students who take responsibility for their own learning.

The following strategies are recommended to develop self-directed learning in ODL:

Provide opportunities for students to connect with content in a variety of meaningful ways by using cooperative learning, interactive lectures engaging assignments, hands-on field experiences, real life problem-based activities and other active learning strategies. Students learn with greater understanding when they share ideas through conversation, debate and negotiation. Explaining a concept to one's peers puts knowledge to a public test where it can be examined, reshaped and clarified. Learning should be situated in realistic settings; testing should be integrated with the task and not a separate activity. Sometimes peer review can be set up to encourage further thinking.

Lecturers should not assume that all students are self-directed and know how to plan, regulate, monitor and evaluate their own learning. It is essential that instructional methods and teaching strategies are expanded to guide students in the use of SDL strategies.

When one creates an atmosphere or a personal approach that fosters the use of SDL and social constructivist approaches students will know that their views are respected as individuals when working in groups or in discussions with lecturers (Schunk et al., 2014:311).

Not all students have the ability to read critically and work through study material independently, especially students' with poor English language proficiency. These students can benefit from mental modelling in class with face-to-face contact, on dvd's, and with interactive whiteboard sessions. Mental modelling also called "Think alouds" or cognitive modeling is a strategy where the lecturer verbalises his/her thoughts aloud while problem solving thus providing an effective example of how tasks should be analysed and which strategies to select and apply. Resources and help seeking should be demonstrated including how to activate prior knowledge, planning activities beforehand, monitoring understanding and progress whilst completing the task and evaluating outcomes and reflecting upon one's learning activities. When lecturers demonstrate the use of SDL and metacognitive strategies by means of mental modelling, students should also be encouraged to question the strategies used. Cognitive learning strategies e.g underlining, highlighting, use of concept mapping should be illustrated so that students can be introduced to these strategies when they have to work through all the textual information in their courses. Students must be encouraged to do the same when completing tasks individually or in group work.

Lecturers should model strategies that include all the decision making processes like when, where, why strategies and make suggestions how students can monitor and evaluate their progress for example by rereading, self-questioning asking themselves how they will attempt a similar task in future.

Dialogue is an opportunity to develop self-directed skills because students are then exposed to their peers' thinking processes. They hear other students' inner speech out loud and can learn different approaches to solve a problem. The waiting time between discussions also provides time for reflection. Learning in support groups is embedded in cultural beliefs and practices of South African students. This ODL institution should therefore facilitate the forming of study groups through social networks that are developed by the university. The lecturer could ask students to send in their profiles so that he/she can link them up with other students in the same area. Lecturers could also include assignments, projects for small groups to satisfy students' needs for social interaction and group learning.

Lecturers can teach students to reflect on their work before or after sessions by letting them comment on what was new, interesting, vague or difficult in their learning tasks.

Different types of feedback should be used in instruction and with written work of students because it has an important influence on student learning and it might influence students' use of self-directed learning skills.

By using portfolios, the common problem of plagiarism of assignments can be avoided. Using portfolios students have the opportunity to relate their knowledge and experience to the new information and do not have to rely on prescribed study material only and secondary texts as resources.

Assessment guides the curriculum and plays a critical role in choices of what lecturers choose to be taught and how content is taught, and on the other hand the assessment methods lecturers use determine what and how students study. Both lecturers and students concentrate on aspects that will be assessed and ignore aspects that will not be assessed, irrespective of outcomes and goals indicated in the students' study material. When assessing written work lecturers could ask students to describe their thinking processes. This will also provide them with opportunities to reflect on their motivation, their task analysis and strategies they used to complete tasks. Students will know they will be assessed on other facets than the knowledge facet of their academic work, for example also on good task analysis, goal setting applied, monitoring and evaluation of their comprehension and progress. While completing learning tasks they will become aware of and concentrate on these skills too. What gets assessed gets

done. If instruction and assessment only emphasizes rote learning and other forms of short term memory retrieval strategies it will be less effective at promoting self-regulated and metacognitive awareness or meaningful learning than instruction that incorporates ways of manipulating existing information such as using it to create a new product or verifying a hypothesis. Therefore while recall of basic information from short-term memory are important, using the information to identify solutions to problems and apply it in a new context is a feature of critical thinking that should be a learning outcome of every teaching episode and assessment.

With self-assessment and provision of model answers students have the opportunity to identify their own misunderstanding or lack of comprehension, and to modify or completely change the learning strategies they have used to complete the task.

Conclusion

The aim of this study was to reflect on challenges for students and lecturers teaching and learning in a social constructivist approach in ODL. Educational practice in ODL is continually exposed to renewal, due to development of technology, globalisation of education and the emphasis on lifelong learning.

ODL students are much more dependent on themselves to attain their learning goals. One can argue that self-directedness plays an important role in learning and in the regulation of mental processes as in the traditional classroom instruction where lecturers can directly observe and support students. The assumption is that without good self-directed learning skills the ODL students will achieve less academic success. To this end, recommendations were made to develop self-directedness in teaching and learning. Isolation and less self-directedness are two main concerns and challenges in a social constructivist approach in ODL. How these challenges may be overcome needs further research. By taking cognisance of ICT in ODL as well as the contextual challenges of students, lecturers can improve the quality of their teaching and the performance of their students.

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Editor's note: This is a challenging topic because different of content, pedagogy, class size and media impact the bottom line. A transition cost and a materials development cost is involved. Once initiated, the curriculum and materials can be continually updated and upgraded. My university paid faculty \$2,500 and gave them design and production assistance to develop open distance learning versions of their courses. A publishing or media production company would have different costs and a very different business model. The discussion that follows establishes a practical baseline for financial planning and analysis.

Cost analysis of Web-based distance learning: A Discounted Cash Flow analysis

Chris Garbett
UK

Abstract

Although the teaching and learning aspects of E-Learning have been examined in depth, and the overall financial implications of E-Learning considered, there is comparatively little quantitative research into the finances of E-Learning. This paper seeks to address this data limitation by examining the financial case for E-Learning; specifically Web-Based Distance Learning (WBDL). The aim of the research is to create a model to quantify the financial case for WBDL under different circumstances. This has relevance to designers and managers of programmes.

Using data from published case-studies, this paper examines the income, expenditure, and revenue streams of WBDL courses. A Discounted Cash Flow (DCF) model is used to analyse the cost and revenue streams. A stochastic modeling approach is then applied to the DCF to analysis the implications, under varying conditions.

The results evidence that the low delivery cost of WBDL, more than offsets any real or perceived development costs. Courses could still be cost effective with small numbers of students, and/or course fees could be significantly lower than fees for traditionally delivered courses.

Keywords: discounted cash flow, DCF, e-learning, costs, finance, on-line learning, economics

Introduction

Due to increased demand for Higher Education (HE) worldwide, previously accepted methods of funding HE no longer suffice. Piketty observes that "*The question of how to pay for education, and in particular how to pay for higher education, is everywhere one of the key issues of the twenty-first century. Unfortunately, the data available for addressing issues of educational cost and access in the US and in France are extremely limited.*" (Piketty, 2014) HE was a high-end luxury good, available to an elite, restricted by academic merit, i.e. a supply-driven market where students competed for a limited supply of places. The cost of providing HE was to some extent subsidised by Government. In Europe, the cost of courses was met by the public purse. Public financial support was based on the assumption that an educated populace produces economic and social benefits, "*A popular government without popular information or the means of acquiring it, is but a Prologue to Farce, or a Tragedy, or perhaps both. Knowledge will forever govern ignorance. And a people who mean to be their own Governors, must arm themselves with the power which knowledge gives.*" (Madison, 1822).

Successive Governments have increased the provision of HE places; the market moving from a supply-led to a demand-led model. Universities compete for a limited supply of students.

New policies, plus Government debt since 2008, have resulted in a world-wide trend for Government funding to be slashed. "*The models of HE that marched triumphantly across the*

globe in the second half of the 20th Century are broken” (Barber, 2013) as reported on mainstream BBC News (News, 2013)

Increasingly, Higher Education Institutions (HEI) look to different methods of provision. One method is WBDL delivery. EU Education Ministers, called for “*curricula development and digital learning...and enabling teaching and learning to take place virtually anywhere*” (EU Education and Culture Council, 2013).

Similarly, the United Nations Education, Social and Cultural Organisation (UNESCO) identifies WBDL as an important factor in cost control in HE stating. “*Economics is (also) driving the revolution. At the same time as the cost of electronically processing, storing and transmitting information has been falling, the cost of conventional education and training has been rising to levels that are particularly unsustainable in emerging economies.*” (Moore, 2002)

Noting that UNESCO, the EU, National Governments, and the leading economist Thomas Piketty are all concerned about the cost of Higher Education; this paper examines the financial case for e-Learning; specifically WBDL. The aim of the research is to create of a model to quantify financial cases for WBDL in different circumstances.

The purpose of this paper is to assist course providers and managers in their decision making.

Features of WBDL

WBDL widens the market for higher education by giving opportunities to: students who could not afford to take time out of employment for full-time study, overseas students in their home country, members of the Armed Forces, the house-bound, shift workers, etc.

WBDL clearly offers scalability and delivery cost advantages compared to traditional face-to-face delivery. Fixed costs, especially accommodation costs, are eliminated or reduced. Different teaching and learning approaches can also significantly reduce variable and marginal costs. The rise of Massive Open Online Courses (MOOCs) evidence how costs of courses online can be ignored. The business case for MOOCs is, however, unclear and this paper specifically excludes MOOCs.

Literature review

The dynamic nature of WBDL and the associated Technology means that the cost implications are continually changing. As data becomes published, it becomes out of date. The leading authority on costing e-learning is Dr Greville Rumble “The Costs and Economics of Distance Learning” (Rumble, 1997) first published in 1997.

Hane N, and Lundberg S (2008) considered a cost-benefit analysis of e-learning as a tool for regional policy. However, the discussion emphasised a high-level consideration and not specific details of costs.

(Sharma (2011) considers the financial costs of e-learning and calculating return on investment (ROI). This is useful for providing a framework for a model but does not provide actual costs.

Jovanovic, Ilic (2012) consider e-learning as a strategy for reducing University costs and concludes that implementing e-learning can reduce costs and affect ROI. The cost data, however, is concerned with aggregates, not a low-level granularity of costs.

The Commonwealth of Learning (Butcher & Hoosen, 2012) considered the business case for Open Education Resources (OER). This provided some useful data on costs of developing online material. This will be referred to in more detail, below.

Boetcher (2013) considers costing the preparation of material, though he is vague about the methodology applied. Again, this will be referred to later.

The Joint Costing and Pricing Steering Group (HEFCE, 2010) examined pricing strategies in Higher Education Institutions (HEI). This, however, was concerned with high-level strategic aims and gave no real data on costs.

Diane Laurillard made major contributions to the issue of cost analysis in e-learning in general but is not specific or restricted to WBDL. Her observation was that “*The costing models in the literature have had almost no impact on practice in educational institutions planning e-learning innovation. ... A more user-friendly model would represent costs in terms of learner, teacher and support staff time for a meaningful period of study time – e.g. a course module, a school week, etc.*” (Laurillard, 2007). Laurillard proposed a costing methodology and cited costs referred to later.

From the literature it is apparent that, whilst cost implications are considered at a high level, there is little actual cost data drawn from case studies.

This paper addresses this gap and seeks to answer the research question; “How can costs and revenue streams be modelled to provide useful information on the financial implications of developing and delivering web-based distance learning courses?”

The aims of this study are to enable course providers to: allocate resources, and, by using sensitivity analysis, model different scenarios to calculate, inter alia, break-even points, and differential pricing.

Methodology

This study is quantitative using published data. The paper does not draw any qualitative conclusions, the relative merits of WBDL courses and face-to-face courses are beyond the scope of this paper.

The data is plotted into a spreadsheet model representing a WBDL course. The course structure used in the model is based on an actual WBDL with which the author is familiar, though different, hypothetical cost data sets are imputed into order to analyse income streams.

Modelling hypothetical and actual data on the structure of an actual course is appropriate, being analogous to a case study, albeit with stochastic interpretations, hence constituting “*...an empirical inquiry that investigates a contemporary phenomenon within its real-life context...*” (Yin, 1994). The context is drawn from real-life as Yin recommends. The data sets used are drawn from published sources.

Modelling data into the structure of an actual course counters the criticism of case study research, that results from one case study may not be representative. Using an actual scenario with varying data gives a robustness and validity to the model, independent of the data.

The financial analysis uses a standard financial model, a Discounted Cash Flow (DCF) approach.

Limitations of the study

This study examines the development and delivery costs using the course, or the module as units of account. In UK convention, a course is the full programme of study leading to an academic award. A module is a discrete component of that award. Students earn credits for completed modules; a specified number of modules, or credits, comprise a course.

Institutional costs are accounted for in the item “Contribution to Central Overheads” (see below). Institutional costs include, but are not limited to; hardware, Virtual Learning Environment, on-line library, central administration, Examination Boards, etc. The identification of these central costs is beyond the scope of this paper, solely examining course and module costs.

Discounted Cash Flow (DCF)

DCF is based on the concepts of Time Value of Money. A sum of money invested today at a given rate of interest (i) will accrue to an amount over a given number of years (n). This is calculated using the formula $(1+i)^n$.

$$\begin{aligned}
 \text{Thus; } £100 \text{ invested for 3 years @ } 4\% &= 100 \times (1+0.04)^3 \\
 &= 100 \times (1.04)^3 \\
 &= 100 \times 1.124864 \\
 &= £112.48
 \end{aligned}$$

£100 today is worth £112.48 in 3 years' time @ 4% interest. Thus, £112.48 to be received in 3 years' time is only worth £100 today (Present Value).

Future income streams are discounted back to their Present Value (PV), using appropriate discount rates.

Income

For ease and clarity the model makes the following assumptions:

No Government subsidies; all income is from student fees.

All students pay-in-advance each semester.

All students take three modules per semester in the first year and two modules per semester thereafter.

No allowance for debtors.

All students graduate.

Although accepting that the above assumptions would not apply in all real-life situations, variations from the assumptions, and hence variations in the income-outgoing patterns are likely to be de minimus, at least in a conventional WBDL course.

The model could be readily adopted to allow for variations, such as debtors, or non-completions. The presence of these assumptions does not invalidate the model.

Costs

There are two classes of costs; fixed costs, and variable costs. Fixed costs are a set amount and incurred irrespective of the number of students. Variable costs are a dependant variable, determined by some other factor. For example, the time taken to mark assignments will depend on: the number of students, and the number of assignments per student.

Development costs

According to (Garbett, 2012) the cost of developing a 20-credit module; equivalent to 200 student study hours, is 24 person hours, where course design and the module specification are already complete. The development is the preparation of a study guide to meet pre-specified learning outcomes. The distance learning (DL) strategy is "wrap around" i.e. the tutor prepares a study guide, broken down into units and topics, pointing the student to relevant learning materials and open education resources (OER) already available on the Web.

Using a mid-point on a senior academic scale of £57 p hour, 24 hrs. equals £1,368. Allowing a 10% uplift for contingencies, i.e. £137, gives an equated cost of £1,505, rounded to £1,500. This is a one-off capital cost per module.

A Canadian study (Bartolci-Zlomislic, 1999) considered the costs of developing an WBDL Masters course developed in 1997. The overall cost data includes set up costs such as initial

course planning, marketing, copyright etc. There is sufficient granularity of the data, however to identify 337 hours development time. Again using the elemental cost unit of £57 p hour, this equates to £19,207 in development (authoring) cost. The notional student hours is not stated, but, assuming a 1997 Masters degree equates to a present day Masters degree; that gives £2,135 to write a 20 credit module. Given the 1997 level of technology, this compares very favourably to the £1,500 cost cited above.

Butcher & Hoosen (2012) *op cit* suggest costs between 1 person hour preparation time: 1 hour student learning; to 3,000 hours preparation time: 1 hour student learning time giving a cost range between £11,400 to £600,000. This range is so extreme that it can not be used for comparative purposes and makes no distinction between types of WBDL material.

Butcher & Hoosen (2012) also cite a case-study from Guyana estimated at 3.8 person hours preparation: 1 hour student learning, including course design and specification. This equates to £43,320 for a 20 credit module. The authors suggest that Guyana experience is not necessarily directly comparable to the experience in other countries.

Boetcher (2013) *op cit.*, suggests 18 hrs preparation: 1 hour student learning, for an inexperienced tutor, giving a capital figure of £205,200 for a 20 credit module. Boetcher suggests that, for an experienced tutor this could be reduced significantly.

Laurillard (2007) produces the following production costs for developing material: ½ hr. staff time: 1 hr. student time for a tutorial, and 1 hr. staff time; 1 hr. student time to produce a Computer-Mediated Communication. This approximates to £5,700 production time for a 200 hr. module.

There clearly is an extremely wide variance in cost estimates.

Table 1
Published costs of developing material

Source	Date	Cost of Producing a 20 credit module
Garbett	2012	£1,500
Bartolci & Zlomislic	1999	£2135
Laurillard	2007	£5,700
Butcher & Hoosen	2012	(£11,400 - £600,000)
Butcher & Hoosen (Guyana study)	2012	£43,320
Boetcher	2013	£205,200

Cost factors

In considering the wide range of costs, some factors should be addressed.

(Price, et al 1999) posed the telling question “*Why do professional educators embrace high-cost technologies when low-cost technologies work as well?*” They perceive a bias in educators towards high cost technologies.

There is also the very understandable position; from both in-house and bought-in development teams, to exaggerate the cost and complexity of the undertaking, to increase income, or to increase staff deployment time. Of the costs cited above, the lower costs come from analysed case studies, the higher costs from quoted estimates.

There are also different types of WBDL. It is beyond the scope of this paper to consider the different approaches being promoted. Different pedagogic, andragogic and heutagogic approaches entail different costs. For example, consider the cost implications of the UK Open University tie-in with the BBC to produce high quality main stream broadcast television programmes.

A further consideration is that more physical and online resources become available over time. In the 1990s, when some of the cost estimates were done, computer applications and computing power was very limited compared to what is available in 2014. The concept of the free Open Educational Resource (OER), was unknown in the 1990s.

Given the above factors, one could reasonably assume that the costs of producing effective, low-tech WBDL course material is on a downward sloping cost curve. The existence of freely available web-based material from high repute HE Institutions suggests that the monetary value of that material is zero; and hence the production cost, if not also zero, is de minimus.

Maintenance costs.

This is the annual cost of maintaining and updating module material. Such data as there is, though limited, is consistent.

Garbett (2010) estimated 1 day (8 hours) per module.

Morgan (2001) identified 1.5 days or 13 hours per unit.

This is a recurring annual cost, incurred 1 year after the first production of the module.

Online tutorials. (OLT)

OLT are synchronous group sessions with the tutor. The model assumes a number of OLT per module. Tutorials are held irrespective of the number of students. If student numbers grow large enough, there may be a need to split the tutorial groups thus increasing the number, and cost, of tutorials. This model, however, assumes that once the limit of students has been reached there is no further growth.

Other variable costs

Other Variable Costs include:

Contribution to central overheads, discussed above. In UK practice this is a % of gross income.

Admin support: x no of hours per student

Individual Tuition, e-mails, telephone tutoring one to one: y no of hours per student

Hypothetical course

To test the model, a hypothetical course is proposed, a new online MSc.

Students take 2 modules per semester, plus an on-going *Research Methods* module. The Dissertation is a double module, i.e. 40 credit points. There are 2 semesters per year. Students join at either semester.

After the initial intake, all modules will be populated by students on 2 cohorts.

All income and expenditure is expressed in Sterling. The model, of course, applies irrespective of currency used.

Income

All income is from student fees. Gross income is the fee income before deductions for central services. In the hypothetical course study, a rate of 40% of gross income is used as the contribution to central overheads. This is a fairly standard % rate reflecting UK practice.

This model assumes 5 students recruited, per semester, 10 students per annum. After Semester 4, the number of students remains constant; students graduating balanced by new recruits. The module fee is £1,000, based on fees at the author's home institution and comparable UK courses.

	Sept-Feb	Feb-June		Sept-Feb	Feb-June		Sept-Feb
<i>Cohort A September Start</i>	Research Methods						
	Module 1	Module 2		Module 5	Module 6		
	Module 3	Module 4		Dissertation	Dissertation		
<i>Cohort B February Start</i>		Research Methods					
		Module 2		Module 1	Module 6		Module 5
		Module 4		Module 3	Dissertation		Dissertation

Fig 1. Course Structure.

In the following tables, variables are shaded.

Income periods

Income comes from two cohorts per annum, in September, and in February. For ease of explanation, the model assumes that all income is received in arrears at the end of the University year.

Expenditure

Fixed costs

Module development costs, 3 new modules to be developed. This first analysis uses costs from the low end of the cost spectrum as a best-case scenario. Online tutorials: 2 No. ½ hr. tutorials per module are specified. Students take 3 modules in the first year and 2 modules in the second year. For convenience, assume 3 modules pa across the course, i.e. 6 hours per semester. This does not vary with the number of students.

Variable Costs

One to One student support and tuition = 2 hrs. per student per module. Again, calculations are based on 3 modules consistently; therefore, one to one student support = (total no of students X 3

modules X 2 hours X academic hourly rate) = total no of students X 6 X hourly rate. This figure of 2 hours is an average based on historic data from the author's experience and may be varied.

The programme specifies 2 assessments per module. 1 hour marking each assessment is from the UK Open University and the Open University Associate Lecturers newsletter (Newsletter, 2010). Again, assume 4 modules consistently (balancing the 3 modules in the previous cost). Therefore, cost = (total no of students X 4 modules X 2 points of assessment X 1 hour X academic hourly rate).

Table 2
Income, Semesters 1 – 11.
From semester 3 onwards all modules are developed and being delivered

Income							
Module Fee	£1,000		Contribution to Central Overheads	40%			
Period	No. New Students	Total No. Students	Notes			Gross Income	Net Income
Semester 1	5	5	New students take	3	modules in the first semester	£15,000	£9,000
Semester 2	5	10	Existing students take	2	modules in second and subsequent semesters	£35,000	£21,000
Semester 3	5	15				£45,000	£27,000
Semester 4	5	20				£55,000	£33,000
Semester 5	5	20				£55,000	£33,000
Semester 6	5	20				£55,000	£33,000
Semester 7	5	20				£55,000	£33,000
Semester 8	5	20				£55,000	£33,000
Semester 9	5	20				£55,000	£33,000
Semester 10	5	20				£55,000	£33,000
Semester 11	5	20				£55,000	£33,000

Administrative support is taken as 2 hours per student. This is students contacting course administration with queries. Mostly queries are resolved at course level. If the student is referred to centrally supplied services such as the library or VLE support, this is accounted for in the contribution to central overheads.

Expenditure, Semester 1

Table 3
Expenditure Semester One

Expenditure									
Academic Time:	£55	p.hr		Admin Time:	£30	p.hr	No of Students	5	
Period	Details		Notes			Total No. Modules		Cost	Total Cost
Semester 1	Module Development		Cost per module		£1,500	3		£4,500	
	<i>Tuition</i>								
	1/2 hr. on-line tutorials	2	Tutorials p module	6	hrs. academic time			£330	
	One-to-One support	2	Hrs. p student p module	10	hrs. academic time			£2,750	
	<i>Assessment</i>								
	Points of assessment p module	2							
	Marking & feedback	1	Hrs. p student p assessment p module	4	hrs. academic time	3		£3,300	
	<i>Admin Support</i>								
	Admissions, Queries, say	2	Hrs. p student	10	hrs. admin time			£300	
									£11,180

Expenditure, Semester 2

A further 5 students are recruited, income increases, there are now 10 students on the course, taking 2 modules. Variable costs, *per student*, increase with the increase in student numbers. The fixed cost of developing the materials decreases, only 2 new modules being developed.

Table 4
Expenditure Semester 2

Expenditure									
Academic Time:	£55	p.hr		Admin Time:	£30	p.hr	No of Students	10	
Period	Details		Notes			Total No. Modules		Cost	Total Cost
Semester 2	Module Development		Cost per module		£1,500	2		£3,000	
	Tuition								
	1/2 hr. on-line tutorials	2	Tutorials p module	6	hrs. academic time			£330	
	One-to-One support	2	Hrs. p student p module	6	hrs. academic time	5		£3,300	
	Assessment								
	Points of assessment p module	2							
	Marking & feedback	1	Hrs. p student p assessment p module	4	hrs. academic time	5		£8,800	
	Admin Support								
	Admissions Queries, say	2	Hrs. p student	20	hrs. admin time			£600	
									£16,030

Expenditure, Semester 3

A further 5 students are recruited, total students now 15. Fixed costs of development; again, a further 2 modules are to be developed. Variable costs; there are now 7 modules being delivered, so variable costs are adjusted.

Table 5
Expenditure Semester 3

Expenditure									
Academic Time:	£55	p.hr		Admin Time:	£30	p.hr	No of Students	15	
Period	Details		Notes			Total No. Modules		Cost	Total Cost
Semester 3	Module Development		Cost per module		£1,500	2		£3,000	
	Tuition								
	1/2 hr. on-line tutorials	2	Tutorials p module	6	hrs. academic time			£330	
	One-to-One support	2	Hrs. p student p module	6	hrs. academic time	6		£4,950	
	Assessment								
	Points of assessment p module	2							
	Marking & feedback	1	Hrs. p student p assessment p module	2	hrs. academic time	6		£6,600	
	Admin Support								
	Admissions, Queries, say	2	Hrs. p student	30	hrs. admin time			£900	
									£15,780

Expenditure, Semester 4

A further 5 students are recruited. The student total is now 20. All modules are developed. Modules are updated and maintained, at 1 day (8 hours) per module. 3 of the 9 modules will be updated each semester. Variable costs, there are now 9 modules being delivered, variable costs are increased accordingly.

Table 6
Expenditure Semester 4

Expenditure									
Academic Time:	£55	P. Hr		Admin Time:	£30	P.Hr	No of Students	20	
Period	Details		Notes			Total No. Modules		Cost	Total Cost
Semester 4	Module Maintenance		Cost per module		£440	3		£1,320	
	Tuition								
	1/2 hr. on-line tutorials	2	Tutorials p module	6	hrs. academic time			£330	
	One-to-One support	2	Hrs. p student p module	6	hrs. academic time			£6,600	
	Assessment								
	Points of assessment p module	2							
	Marking & feedback	1	Hrs. p student p assessment p module	4	hrs. academic time			£17,600	
	Admin Support								
	Admissions, Queries, say	2	Hrs. p student	40	hrs. admin time			£1,200	
									£27,050

Further considerations

Modules may be shared between different courses. Where modules have already been created for one course, in costing a new course there will be zero development costs for these modules. Also, student numbers will differ between modules. Clearly, where a module is shared between 3 different courses, the course marginal costs will be reduced by 3.

Discounted Cash Flow analysis

Mapping revenue streams, and applying a PV Factor @ 4% the following 10 year (20 semesters) DCF emerges:

4% was selected for historical reasons. (Piketty, 2014) states “... *the mean return we generally see (averaging all types of investments) is generally closer to 4-5% (before taxes).* Varying the discounting rate would affect the yield or IRR. The user could vary the discounting rate.

Table 7
10 year DCF. This approximates to IRR of 264%, over the period.

10	Year Discounted Cash Flow Analysis			Rate	4.00%
Semester	Net Income	Total Costs	Net Cash Flow	PV @	Net Present Value
1	£9,000	£11,180	-£2,180		-£2,180
2	£21,000	£16,030	£4,970	0.9612	£4,777
3	£27,000	£15,780	£11,220	0.9423	£10,573
4	£33,000	£27,050	£5,950	0.9238	£5,497
5	£33,000	£27,050	£5,950	0.9057	£5,389
6	£33,000	£27,050	£5,950	0.8880	£5,283
7	£33,000	£27,050	£5,950	0.8706	£5,180
8	£33,000	£27,050	£5,950	0.8535	£5,078
9	£33,000	£27,050	£5,950	0.8368	£4,979
10	£33,000	£27,050	£5,950	0.8203	£4,881
11	£33,000	£27,050	£5,950	0.8043	£4,785
12	£33,000	£27,050	£5,950	0.7885	£4,692
13	£33,000	£27,050	£5,950	0.7730	£4,600
14	£33,000	£27,050	£5,950	0.7579	£4,509
15	£33,000	£27,050	£5,950	0.7430	£4,421
16	£33,000	£27,050	£5,950	0.7284	£4,334
17	£33,000	£27,050	£5,950	0.7142	£4,249
18	£33,000	£27,050	£5,950	0.7002	£4,166
19	£33,000	£27,050	£5,950	0.6864	£4,084
20	£33,000	£27,050	£5,950	0.6730	£4,004
	£618,000	£502,840	£115,160		£93,302

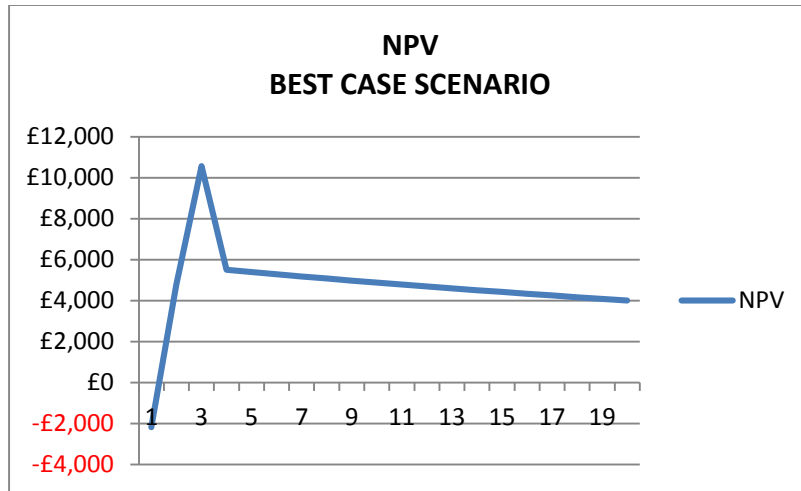


Fig 3. In the best case scenario, the course falls into profit in the second semester.

Sensitivity analysis

The DCF model permits sensitivity analysis by manipulating variables; hence a number of different scenarios are modelled:

Table 8
10 year DCF. Ceteris Paribus, fee reduced to £820 per module.

10	Year Discounted Cash Flow Analysis			Rate	4.00%
Semester	Net Income	Total Costs	Net Cash Flow	PV @	Net Present Value
1	£7,380	£11,180	-£3,800		-£3,800
2	£17,220	£16,030	£1,190	0.9612	£1,144
3	£22,140	£15,780	£6,360	0.9423	£5,993
4	£27,060	£27,050	£10	0.9238	£9
5	£27,060	£27,050	£10	0.9057	£9
6	£27,060	£27,050	£10	0.8880	£9
7	£27,060	£27,050	£10	0.8706	£9
8	£27,060	£27,050	£10	0.8535	£9
9	£27,060	£27,050	£10	0.8368	£8
10	£27,060	£27,050	£10	0.8203	£8
11	£27,060	£27,050	£10	0.8043	£8
12	£27,060	£27,050	£10	0.7885	£8
13	£27,060	£27,050	£10	0.7730	£8
14	£27,060	£27,050	£10	0.7579	£8
15	£27,060	£27,050	£10	0.7430	£7
16	£27,060	£27,050	£10	0.7284	£7
17	£27,060	£27,050	£10	0.7142	£7
18	£27,060	£27,050	£10	0.7002	£7
19	£27,060	£27,050	£10	0.6864	£7
20	£27,060	£27,050	£10	0.6730	£7
	£506,760	£502,840	£3,920		£3,472

Scenario minimum fee

Ceteris paribus, the module fee could be reduced to £820 per module to achieve break even.

Worst case scenario. cost increase, income decrease.

Development costs have been increased 4 X to £6,000 per module. Maintenance costs increase 3 X to 24 hrs. per module. Student recruitment is reduced to 4 students per semester. Fee remains at £1000 p module.

Table 9
Worst case scenario. costs rise, recruitment falls

10	Year Discounted Cash Flow Analysis			Rate	4.00%
Semester	Net Income	Total Costs	Net Cash Flow	PV @	Net Present Value
1	£7,200	£22,970	-£15,770		-£15,770
2	£16,800	£22,490	-£5,690	0.9612	-£5,469
3	£21,600	£22,290	-£690	0.9423	-£650
4	£26,400	£24,610	£1,790	0.9238	£1,654
5	£26,400	£24,610	£1,790	0.9057	£1,621
6	£26,400	£24,610	£1,790	0.8880	£1,589
7	£26,400	£24,610	£1,790	0.8706	£1,558
8	£26,400	£24,610	£1,790	0.8535	£1,528
9	£26,400	£24,610	£1,790	0.8368	£1,498
10	£26,400	£24,610	£1,790	0.8203	£1,468
11	£26,400	£24,610	£1,790	0.8043	£1,440
12	£26,400	£24,610	£1,790	0.7885	£1,411
13	£26,400	£24,610	£1,790	0.7730	£1,384
14	£26,400	£24,610	£1,790	0.7579	£1,357
15	£26,400	£24,610	£1,790	0.7430	£1,330
16	£26,400	£24,610	£1,790	0.7284	£1,304
17	£26,400	£24,610	£1,790	0.7142	£1,278
18	£26,400	£24,610	£1,790	0.7002	£1,253
19	£26,400	£24,610	£1,790	0.6864	£1,229
20	£26,400	£24,610	£1,790	0.6730	£1,205
	£494,400	£486,120	£8,280		£2,218

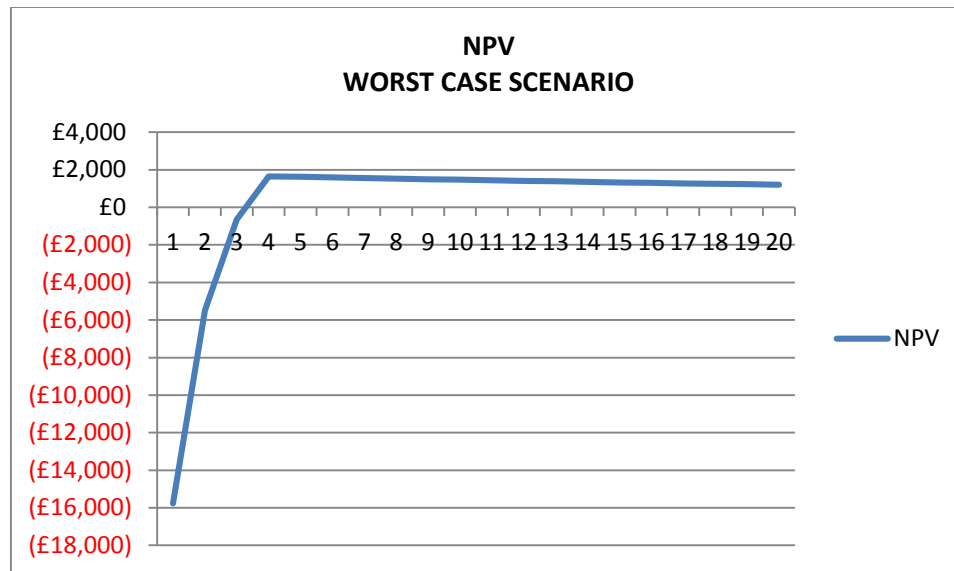


Fig 4. Worst case scenario.
In this scenario, a positive cash flow is still achieved in semester 4

Conclusions and future study

The stated aim of the paper was "... the creation of a model that can be used to quantify that financial case for WBDL and to calculate Return on Investment (ROI) under different circumstances".

The purpose of the work was "... to use published data sources to identify, and model, the costs of WBDL; thus enabling course providers and policy makers to undertake their own modelling and aid the decision making process".

Identifying capital and revenue costs and income streams; and utilising a DCF approach, different scenarios are compared, thus permitting sensitivity analyses to be undertaken.

The financial analysis of E-Learning impacts in the following areas:

Though the cost of developing WBDL material is perceived as prohibitively high, some work identifies lower cost solutions. When discounted over the life of the programme, moreover, the development costs are not the most significant variable affecting the viability of the course.

With even modest student numbers, a positive return is available. At the lowest cost, break-even is possible (though not recommended) with very low student recruitment.

Student fees for WBDL course could be substantially lower than fees for traditional face to face courses.

Further research is being undertaken to identify the full Life Cycle Costs of WBDL.

Spreadsheet files may be obtained by application to the author.

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Factors influencing the adoption of information communications and technology (ICT) in language teaching

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Abstract

The present study investigates institutional, personal and technological factors that affect the integration of information and communication technology (ICT) in language classes. It precisely demonstrates the main factors that encourage language teachers to use computers and new technologies in teaching-learning processes. It also presents a clear description of institutional or school-level, teacher-level and system-level factors that prevent language teachers from ICT adaption and integration in teaching. These barriers comprise lack of teacher confidence, lack of teacher ICT skills, lack of professional teacher training programs, lack of appropriate educational software, restricted and inflexible educational system structures and restricted curriculum. The study concluded that knowing and realizing the extent to which these barriers influence institutions and individuals will be helpful in making decisions on how to handle and tackle them.

Keywords: Communication technologies; ICT adoption; ICT integration; institutional factors; technological factors; personal factors; CALL; computers; language learning; competence

Introduction

ICT adoption and use of modern technologies in language teaching recently has been rapidly increasing throughout the world. In fact, with the creation of World Wide Web, it has come to be feasible for L2 teachers to access instructional materials and make effective use of them in teaching language. Computer assisted language learning (CALL) programs provide multimedia with graphics, sounds, video, and text that permit students to be exposed to the target language and as well as its culture. Language learners simulated the setting with meaningful and substantial multimodal forms, like audio-visual input which facilitates reading and listening comprehension (Verdugo & Belmonte, 2007).

Teachers are the central individuals to implement innovation (Fritz, Miller-Heyl, Kreutzer, & MacPhee, 2001). However, it is essential for teachers to improve their technological literacy and pedagogical understanding and knowledge when implementing new technologies. For effective and successful adoption of ICT in language teaching, it is crucial to realize how and why language teachers use information and communication technology (ICT) and as well as to reveal the barriers which language teachers confront when trying to implement ICTs into their language instruction.

Global investments in ICT to improve and enhance teaching and learning processes in education have been started by several governments. For instance, the government of UK spent £2.5 billion (Nut, 2010) on educational ICT in 2008-2009, the US government spends \$6 billion on K-12 schools and higher education institutions, the New Zealand government spends more than \$ 410 million on school ICT infrastructure every year (Johnson, Calvert & Raggert 2009). A Gulbahar (2007) mentions, in spite of all the investment on ICT infrastructure, facilities, technological equipment and professional development to enhance education in many countries, there is a little evidence of ICT implementation in teaching and learning processes. A number of studies are carried out to examine and research factors that are associated with teachers' used of computer technology in teaching-learning processes (Baek, Jung & Kim, 2008; Norton, McRobbie, & Cooper, 2000).

Factors influencing teachers' adoption and integration of ICT

Prior to the review of factors affecting adoption and integration of ICTs by language teachers, the concepts of adaption and integration need to be described. According to Rangaswamy & Gupta (2000), adaption is the decisions that people make every time that they adopt an innovation. As Rogers (2003) mentions, adoption is the decision of individuals to use an innovation as the best accessible course of action. He argues that the adoption process begins initially by hearing about an innovation.

Earle (2002) associates ICT integration with the concept of wholeness, mentioning that all components of the system are connected together in order to become a whole. For example, content and pedagogy are two significant elements of learning and teaching that should be connected when new technology is used in the class. Williams (2003) states that ICT integration is a means of using any ICT tool, such as internet, CD ROMs, DVD ROMs, e-learning, etc, to assist learning and teaching. Williams' definition of ICT integration will be used for the purpose of the present study.

A number of factors that affect adoption and integration of ICTs into teaching and learning have been identified by researchers during the past decade. Rogers (2003) introduced five technological attributes which affect the decision to adopt an innovation or a new technology. Similarly, Stockdill and Moreshouse (1992) introduced technological consideration, user features, content features, and organizational capacity as factors affecting ICT adoption and integration into teaching. Balanskat, Blamire & Kefalla (2007) introduced the affecting factors as teacher-level, school-level and system-level. In fact teachers' ICT integration in teaching is also affected by organizational factors, attitudes towards new technologies and other factors (Chen, 2008, Tondeur; van Braak & Valcke, 2008; Lim & Chai, 2008; Clausen, 2007). According to Sherry and Gibson (2002), individual, technological, organizational and institutional factors should be regarded when investigating about ICT adoption and integration. According to Neyland (2011), factors such as organizational support and as well as teacher capability, affect the use of online learning in high schools in Sydney. The present research paper reviews researches on the use of ICTs by teachers and identifies significant factors included and classified in the framework of Sherry and Gibson (2002).

Personal characteristics

As Schiller (2003) mentions, personal characteristics such as educational background, educational level, age, gender, computer skills, experience with the computer use for educational purpose, educational experience and attitudes towards the computers and new technologies can affect the adoption of a technology in teaching. Teachers are entreated to adopt and integrate ICTs into teaching and learning process, but in fact teachers' readiness to integrate information and communication technologies (ICTs) determines the success and effectiveness of technologies, not just its existence in the classroom. Teachers' attitudes towards modern technologies significantly influence the adaptation and integration of ICT into their teaching. Factors such as stress and anxiety, lack of confidence and knowledge, lack of computer skills and fear result in avoiding ICT integration in teaching-learning activities. Consequently an understanding of teachers' personal characteristics that affect ICT adaption and integration is very essential.

Teachers' attitudes

Effective and successful use of instructional technologies in school programs, specifically in language classes, depends greatly on language teachers' attitudes and support. If teachers recognize and perceive modern technologies as fulfilling neither their demands nor their students' needs, they probably will not implement and integrate them in teaching and learning activities in language classes. Teachers' attitudes and beliefs towards modern technology and ICT are among the significant factors that can influence the implementation and integration of ICT in

second/foreign language teaching. If language teachers possess positive attitudes towards modern educational technologies, then it is likely that they easily provide a useful insight and perception about the adoption and integration of ICTs into the teaching-learning processes. Language teachers' attitudes towards modern technologies and ICTs are very crucial and determinant to successful and effective integration into the language teaching and learning activities.

Toe (2008) conducted a research in Singapore on pre-service teachers' attitudes towards computer use. 139 pre-service teachers participated in the survey and their attitudes towards computer use were assessed via using a questionnaire with four factors including: perceived usefulness, effective, perceived control, and finally behavioural intentions to utilize the computer. He noticed that teachers' attitudes towards computers and intentions to use computers were more positive than their perceptions about the usefulness of computer and as well their control of computers. Similarly, Drent & Meelisse (2008) conducted a survey about factors which affect the innovative use of ICTs by teachers in Netherlands. Participants of this study were 210 teachers. Their research study revealed that positive attitudes towards computer use, student-oriented pedagogical strategies and computer experience have a significant influence on the innovative use of ICTs by teachers. Language teachers' attitudes towards modern technologies affect their acceptance of the technologies' usefulness and integration of ICT into teaching.

The computer experience of language teachers relates positively to their attitudes towards computers. The more experience with the computer, the more likely teachers will demonstrate positive attitudes towards computers (Rozell & Gardner, 1999). Positive attitudes towards computers can foster computer implementation and integration in the classroom (van Braak, Tondeur & Valcke, 2004). Woodrow (1992) determined that, for successful and effective transformation in educational programs, the user should develop a positive attitude towards innovations.

ICT competence

ICT competence as one of the significant factors which influence the ICT integration in language teaching-learning processes can be simply defined as capability to deal with and handle a wide range of different computer applications for a variety of purposes. As Na (1993) and Berner (2003) assert, teachers' computer competence is a key predictor of ICT integration in teaching. Evidence demonstrates that most of the teachers who reported neutral or negative attitudes towards ICT integration in teaching-learning processes lacked sufficient skills and knowledge of computer and ICT use. Therefore it is crucial to provide sufficient support for language teachers to improve their computer skills and ICT competence in order to help them to successfully integrate ICT in their teaching which finally will boost the language teaching and learning processes. Language teachers with more experience in computers and ICTs have much more confidence in their capabilities to use them effectively in the language classes; in other words teachers' computer and technology competence is connected directly to their confidence. On the other hand, teachers' confidence also is related to the understanding and perception of their capabilities and skills to utilize ICTs in the classroom.

Computer self-efficacy

Language teachers' self-efficacy is another important factor that affects ICT integration in second/foreign language classes. Self-efficacy can be defined as a belief in ones' own capabilities to perform an activity which is essential to achieve intended goals. In other words, self-efficacy can be defined as the confidence which individuals have about their own abilities to perform tasks or activities that need to be done. According to Peralta & Costa (2007), teachers' confidence pertains to both teachers' perceived success using ICTs for educational programs and as well as how far they perceive success as being under their control. Compeau & Higgins (1995) assert that teachers' computer self-efficacy is defined as a judgement of their abilities to make use of

computer. Teachers' self-efficacy can directly influence the implementing and integrating ICT in teaching and learning in language classes.

According to Christensen and Knezek (2006) computer self-efficacy is in fact the computer confidence in competence. Knezek and Christensen (2002) depict that teachers' competence with computer technologies is a significant factor that can influence the effective use of ICT in teaching. In a research conducted by Peralta and Costa (2007) with a sample of 20 teachers in Italy, to assess teachers' competence and confidence towards the ICT use in the classroom; it was revealed that teachers' competence with technologies is a key factor of developing greater confidence in the use of ICT. Moreover, in Greece, teachers demonstrate personal and pedagogical factors as those of which greatly assist their confidence in using ICT.

Obviously if L2 teachers lack confidence, they will be reluctant to make use of ICTs in the teaching-learning activities. Some of the reasons for the lack of confidence for integrating ICT in language classrooms include lack of ICT knowledge, fear of failure and anxiety. Teachers who do not consider themselves to be skillful and experienced in ICT, probably feel nervous and anxious about using ICT in the classroom and therefore they prefer not to use ICT in their teaching.

Teaching experience

Although a number of studies claimed that teaching experience did not affect their use of computer technologies in teaching (Niederhauser & Stoddart, 2001), most of the recent studies demonstrate that experience in teaching influence the effective use of ICT in classroom (Wong & Li, 2008; Giordano, 2007; Hernandez-Ramos, 2005). According to Gorder (2008), teacher experience is correlated with the use of technologies. She asserts that successful and effective use of computers is related to technological comfort levels and as well as the freedom to form instructions based on student and teacher needs.

Baek, Jong & Kim (2008) also mention that less experienced teachers are less ready to adopt and integrate ICT in their teaching. Likewise, U.S National for Education Statistics (2000) claimed that less experienced teachers were more likely to integrate computers in their teaching than experienced teachers. Accordingly, the report demonstrated that teachers who had less than three years teaching experience spent 48% of their time using computers, teachers with four to nine years of experience spent 47% of their time using computers, teachers with 10 to 19 years of teaching experience spent 45% of their time using computers, and finally teachers with more than 20 years of teaching experience spent 33% of their time using computers. The reason of this disparity may be due to the fact that fresh teachers probably are more experienced in using computer technologies.

On the other hand, Lau & Sim (2008) in their research on ICT adoption by secondary school teachers in Malaysia, reveal that the older teachers in contrast to the younger teachers more frequently use computer technologies in the classroom. It can be due to the fact that the older and the teachers who have more teaching experience, classroom management and as well competent in computer use can easily integrate ICT into their teaching. Their finding is in agreement with Russell, Bebell, O'Dwyer, & O'Connor, (2003) who depicted new teachers who were very skilled with technologies more than older teachers did not incorporate new technologies or ICT in their teaching. They identified two reasons, namely: (1) new teachers' attention could be on how they can make use of ICT instead of how to incorporate ICTs in teaching-learning processes and (2) new teachers could encounter a number of possible challenges in their first few years of teaching and devote most of their time in familiarizing themselves with schools' curriculum and as well as classroom management. However, in their research, Granger, Morbey, Lotherington, Owston and Wideman (2002), which was a qualitative survey on factors which contribute successful implementation of ICT by teachers in Canada, demonstrate that there is no relationship between

teachers teaching experience and experience of using ICTs and mention that teachers' ICT skills and effective implementation is intricate.

Teacher workload

Numerous research studies revealed that teachers' workload affects their acceptance of technologies in classrooms. Neyland (2011), in a study conducted in Sydney, with a sample of 26 computer coordinators, stated that increased workload of teachers is alarming. Similarly, Abuhmaid (2011), in his research on effectiveness of ICT training classes within the Jordanian system, mentioned that one of the participants believed that teachers are already overloaded and they cannot cope with and handle the pressure from ICT training. Moreover, one of the teachers asserted that "teachers are already overloaded to learn, to prepare and practice what they learn" (p. 12). As Fullan (2003) mentions, in order to make it possible for teachers to understand the objectives of educational system as well as implementing new technologies and innovations, it is essential to decrease the workload of teachers.

Institutional characteristics

Another important factor that affects integration of ICT in language classes is institutional characteristics. Institutional features help to develop language teachers' existing attributes. In line with Vannatta & Fordham (2004), teachers' time devoted to teaching activities and amount of technology training are generally reliable facets of technology utilization in class. Vannatta & Fordham (2004), demonstrate that teachers, administrators and trainers should not only provide considerable and substantial training on educational technologies, but also they should facilitate a contribution to teaching improvement as well. Therefore, the importance of access to technology or in other words the availability of modern technologies is very crucial for a successful language teaching and learning; additionally the perception of institutional characteristics which affects teachers' integration of ICTs into teaching is essential and relevant.

Professional development

Teachers' professional progress is a substantial factor to a productive and successful integration of ICT in second/foreign language classes. A number of research studies have revealed that regardless of whether experienced or beginner, ICT training programs improve teachers' competence and knowledge in computers (Bauer & Kenton, 2005; Franklin, 2007; Wozney et al., 2006), positively affect teachers' attitudes towards computers (Hew and Brush, 2007; Keengwe and Onchwari, 2008) and also help teachers to recognize and understand the function of technologies and how new technologies can be significant to students' learning (Plair, 2008). In line with Muller and his colleagues (2008), it should be mentioned that technology training programs and professional development are essential factors for successful integration of ICT in language classes; because language teachers' technology competence and skills are drastically determinant for ICT integration in language classes which finally lead to a successful language teaching and learning and it will help language learners to boost their language skills more efficiently and effectively. According to Sandholtz & Reilly (2004), training programs which focus on ICT pedagogical training instead of technical issues assist teachers to use technologies in teaching-learning processes. Recent studies demonstrate that professional training programs assist teachers to implement and integrate technologies and thus transform teaching practices (Brinkerhoff, 2006; Diehl, 2005). Teachers may implement and integrate ICTs into their teaching especially when training programs focus on value, subject matter and the technology.

Plair (2008) asserts that teachers need experts in technology to indicate clearly the right way of integration of ICT in order to facilitate students' learning. Teachers' perceptions of content knowledge and the ways in which they can employ new technologies to support students learning are as closely associated with their improvement in knowledge level, attitudes towards technology and confidence. Language teachers who incorporate and integrate technology

obtained through professional training programs with new teaching strategies can effectively transform the students' performance. Professional training programs for language teachers that involve strategies and practices to address skills, knowledge and beliefs can develop teachers' insights and awareness regarding the transformations in language teaching-learning activities.

Accessibility

As Plomp, Anderson, Law, & Quale (2009) assert, access to ICT infrastructure and technological resources in schools is an essential condition to the implementation and integration of ICT in education. Successful and effective integration of ICTs in language classes primarily depends on the accessibility and availability of ICT resources in educational organizations or schools. If language teachers cannot access new technologies or ICT resources, obviously they will not use them. Thus, having access to computers, modern technologies, updated software and hardware are central elements to effective and successful integration of technologies in language teaching. According to Yildirim (2007) access to technological resources is one of the significant ways to teachers' pedagogical usage of ICTs in teaching.

It is obvious that access to software and hardware must be complemented with employment of appropriate tools and programs and technologies to support teaching-learning processes. Access to suitable technological resources implies that affordances and limitations of a technological tool are considered when the tool is to be integrated in teaching. It is essential to know how each resource impacts learning in order to apply the most effective ones in teaching.

Technical support

According to Jones (2004), computer breakdowns lead to disruption and if there is lack of technical support, normal and regular repairs of computer will not be done and teachers not necessarily use computers in their teaching. The consequence is that teachers will be frustrated and discouraged from employing computers in their teaching because of the fear of equipment failure, due to the fact that no one would give them technical support and nobody will assist them in case if there is a technical problem. Yilmaz, (2011) in his study of evaluating the technological integration in Turkish educational organization, asserts that besides providing technological equipments such as software, hardware and internet, it is also very essential to provide technical support in schools regarding the repair and support for the use of ICTs in schools. If there is not sufficient technical support for language teachers, they become discouraged and this leads to their reluctance to use ICTs in teaching. On the other hand, if there is sufficient technical support in schools, it can easily encourage teachers to implement and integrate ICT in their teaching and it will develop their interest and exuberance to effectively use new technologies in teaching-learning processes.

Technological characteristics

One of the main factors which can affect the diffusion of innovation and as well innovation adaption is technological characteristic. According to Rogers (2003), innovation attributes namely: compatibility, trialability, relative advantages, observability and complexity as perceived by people affect the rate of adoption. He asserts that understanding the perceptions of innovation has a substantial effect on future prognostication of the adoption of specific innovation. Understanding teachers' perception of innovation is a significant factor to the successful adoption and integration of technology in teaching and learning. According to Groff & Mouza (2008), teachers operate as innovators when they integrate ICT in teaching.

In line with Smarkola (2007), perceived ease of use and perceived usefulness are also predictors of the user acceptance of new technologies. Innovations or new technologies which offer useful advantages, trialability, less intricacy, compatibility with existing beliefs and practices and observability are among the most significant factors in prognosticating and predicting teachers

intentions to utilize technologies. If teachers, thus, perceive that new technologies and innovations have significant advantages over the existing ones, easy to adopt, compatible with their personal and social needs, trialable in advanced before using, and finally have observable results, it is likely that teachers will adopt, implement and integrate them quickly.

Conclusion

It is a fact that the rise of new technology has made its adoption and integration more complicated for teachers. The effective and successful integration of new technologies into the classroom and teaching activities creates a challenge to language teachers connecting computer systems to network. For a successful, effective and productive integration of ICT in language teaching, this study has pointed out the factors which positively and negatively affect language teachers' use of ICT. These include: (1) personal factors (2) institutional factors and (3) technological factors.

On the personal perspective or level, there are several factors which affect language teachers' utilization of ICTs in language teaching. Factors such as teachers' knowledge and understanding, feelings and emotions, and teachers' attitudes affect the use of ICT in language classes. Teachers' attitudes towards new technologies affect their acceptance of usefulness of the technologies and consequently their integration into teaching. Teachers positive attitudes towards the use of modern educational technologies in teaching, can easily establish useful insights about the integration of ICTs into teaching-learning processes.

On the school or institutional level, many factors such as professional training programs, funding, technical support, and facilities affect language teachers' adoption and integration of ICTs into their teaching. Teachers' professional development is a central factor to an effective and successful ICT integration into teaching. ICT professional training programs improve teachers' competence in ICT use, affect teachers' attitudes towards computers and help teachers to perceive the function of new technologies

On the technological level, for an effective use and a successful integration of ICTs into language teaching classes, teachers should perceive the new technologies as better than former practices, in line with their existing values, previous experiences and needs; easy to make use of and work with, opportunity to experiment before deciding about the adoption and integration in the classroom and finally observability of outcomes or in other words, the result of innovation and new technology usage are visible. Many language teachers hesitate to alter an existing or a current method to something that they know only from discussion and reading and not by actual observation. Teachers' attitudes towards ICT and use of modern technologies in their classroom is a key factor for a successful integration into the teaching - learning process. If teachers possess negative attitudes towards new technologies, even providing the best ICT facilities and innovations may not persuade them to utilize it in their teaching. Teachers, thus, need to be certain that technology can make their teaching processes much easier, interesting, more enjoyable, motivating and fun for themselves and as well as for the students.

Finally, barriers that frustrate and discourage language teachers were discussed. These factors can be classified into institutional or school level, teacher-level, and system level. The institutional or school-level barriers include lack of appropriate educational software, absence of information and communication technologies (ICTs), old and outdated hardware and software, limited access to ICTs, and limited ICT project experience. The teacher-level barriers comprise lack of teachers' confidence, lack of teachers' ICT knowledge and skills, lack of pedagogical teacher training and lack of exuberance to use ICT in teaching. The system-level barriers consist of traditional assessment, inflexible structure of traditional educational system, restricted and inflexible curricula and organization structure. As Becta (2004) depicts, knowing and realizing the extent to which these barriers can influence institutions and individuals will help in making decisions on how to handle and tackle them.

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