

The Architecture of Interactive Multimedia Courseware: An Empirical-Based Approach: Phase Two

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Abstract

This experimental research was aimed at developing an interactive multimedia courseware to be utilized in Malaysian classrooms. A courseware for interactive instructional design for learning Arabic was designed, incorporating Mayer's Cognitive Load in Multimedia Learning (Mayer, 2001), Gagne's Nine Steps of Instructional Events (Gagne, 1985), Keller's ARCS Model of Motivational Design (Keller, 1988), and ASSURE Model of instructional Design intervention (ASSURE, 1999). The process of developing the software was divided into three phases, namely the conceptual phase, the conventional phase and the engineering phase. This paper discusses the second phase namely; the engineering phase. Furthermore, as this research utilized real life applications of the above models and theories of instructional design, the courseware design thus created and tested in the classroom. This multimedia interactive courseware could act as a prototype for future instructional design developers. This experimental phase discusses the empirical aspects of the finished product in an actual institution setting. Part three of this research will discuss the conventional methods of learning the Arabic language in an actual classroom setting.

Keywords: Multimedia courseware, Instructional design, Arabic language, Software engineering

Introduction

Designing an interactive multimedia instruction is a very challenging task (Qais, 2012). According to (Xun et al., 2005) the development of instructional design is invoking "*higher-order thinking skills*". Effective instruction entails careful blending of planning, task analysis, experience, needs of intended learners and technical considerations. Dijkstra (2004) defines instruction as a medium of communication between students and the teacher. Hence a good instructional design can revolutionize conventional classroom instruction, making learning more effective. This is achieved by providing learners with a set of procedures to make the learning process more meaningful, flexible and imaginative. As the primary purpose of an instructional design is to facilitate the learning process, it has to offer explicit directions for learners to achieve excellence in their studies. It should enhance the acquisition of new knowledge and allow learners to apply such new knowledge (Rogers, 2002).

Problem Statement

Most multimedia instructions are based on the traditional method of one nail hits all approach. Teacher-centered instruction still prevails in many Malaysian classrooms, for example, where Arabic is taught as a foreign language. The challenge faced in many classrooms is how to make the learning of a language more enjoyable and effective. Hence, the main objective of this multimedia instructional design is to meet this daunting challenge. It should provide a set of procedures for an effective learning environment. It should also offer explicit directions for learners to achieve excellence in their studies. Accordingly, there is a need to design a good multimedia courseware to enhance students' new knowledge and assist them in the application of the new knowledge acquired (Rogers, 2002).

Objectives

1. To design an effective interactive multimedia courseware that improves students' comprehension, motivation and satisfaction in the classroom.

2. To design an effective interactive multimedia courseware that helps learners improve their academic performance such as grade in the exam.
3. To design an effective interactive multimedia courseware that can be prototyped as an alternative to the traditional learning paradigm in Malaysian classrooms.

Research Hypothesis

This research argues that when students are exposed to multimedia learning instructions such as BAIK, it significantly increases their comprehension skills, motivation and satisfaction in learning. Most importantly, academic performance is improved.

Rationale of the Research

1. The results of this experimental research could offer guidelines for future researchers on the methodology of designing an effective interactive multimedia Arabic courseware. The findings of this research would also contribute to the expansion of a paradigm such as Constructivism.
2. The findings of this empirical research could be prototyped for learning other languages in Malaysian classrooms.
3. This study might be able to offer guidelines for a more viable alternative to the traditional methods of teaching the Arabic Language in the Malaysian environment.
4. This research would assist Malaysian educators overcome the shortage of well-trained Arabic Language teachers in Malaysian classrooms by providing an effective interactive multimedia Arabic Language courseware which is student-centered, theoretically sound and field-tested.
5. Interviews, observations, questionnaires and checklists from this study would yield valuable information for future researchers in language learning.

Literature Review

The engineering design for this courseware is derived from models used by renowned psychologists; such models include Mayer's Cognitive Load in Multimedia Learning (Mayer, 2001), Gagne's Nine Steps of Instructional Events, (Gagne, 1985), Keller's ARCS Model of Motivational Design (Keller, 1988), ASSURE Model of instructional Design intervention (ASSURE, 1999). PUBLISHED IN THE PHASE ONE. Instruction entails careful blending of planning, task analysis, experience, intended audience and technical consideration. Dijkstra, (2004) defines instruction as a medium of communication between students and the teacher. The Instructors must realize that a good instructional design can bestow a new life to our conventional classroom instruction, Qais, (2012).

Instructional designers must comprehend that technology assisted instructional arouses the young to learn meaningfully, elastically and imaginably. As such, our classroom culture, which has ruled the learners for many decades, needs to be redefined in order to create an environment where students are contented and enjoy their learning in a momentous manner (Rosman, 2006). The prime purpose of instructional design is to help people learn better. It provides a set of procedure for an effective learning. It also offers explicit direction for learners on how to achieve excellence in their studies. Instruction should enhance students' new knowledge and allow them to practice the new knowledge (Rogers, 2002).

According to Mayer, (2003) to construct a feasible instructional design, the following eight essential principles must be taken into consideration:

Multimedia Principle: Students learn better from words illustrated by pictures rather than words alone.

Contiguity Principle: Students learn better if the words and pictures are presented concurrently rather than presented individually.

Coherence Principle: Students learn better if all redundant words, sounds and pictures are excluded from the instruction.

Modality Principle: Students learn better if words are supplemented with narration rather than just appearing as text on the screen.

Redundancy Principle: Students learn better with animation and narration, rather than animation, narration and text on the screen.

Interactivity Principle: Students learn better if they are engaged personally.

Signaling Principles: Students learn better if narrated information is divided into small segments for easy comprehension.

Personalization Principle: Students learn better if information is presented to them as a conversation.

Gagne's learning principles, explain that learning takes place when learner's attention is fully engaged in the classroom. The nine principles of Gagne's conditions of learning are recommended. The ARCS model of instructional design is a sequential process. Keeping the learner interested all the time is a prerequisite for successful teaching. If the learner is distracted, he will not be able to focus and pay full attention to the task. Hence, learning will not be effective.

ASSURE principles of instructional design stipulate that in order to provide effective instruction; the following guidelines must be present in the design, *viz.* attention, relevancy, user confidence and satisfaction

Research Methodology

In this experimental research, a **Triangulation** Method, comprising quantitative, qualitative and descriptive design, was adopted. The qualitative method was used to collect and analyze data while the quantitative method was used to further strengthen the qualitative data. Research shows that quantitative data reinforces qualitative data (Qais, 2012). According to Thomas (2004), it is better to use both eyes rather than one in research. Research further indicates that qualitative methodology is very naturalistic and conducted in real time with the investigator in control (Bogdan and Biklen, 2003), (Golafshani, 2003), (Hoepfi, 1997). Studies have also indicated that a mixed methodology design leads the researcher to a better understanding of the research problem. As such, this study has combined the two methods to complement each other in the field (Hanson and Creswell, 2005).

Population and Sample

This experimental study was conducted at a primary school in Malaysia. Two classes of grade 3 pupils, comprising 41 students, were selected. One class for BAIK and another class for conventional teaching (phase three). The mean age of the students was 9 years; all of them had similar socio-economic backgrounds. The instruments used to collect data were (1) pre-test and post-test, and (2) checklist to evaluate pupils' reactions, facial expression, level of satisfaction and motivation in the classroom, (3) interviews with selected students, (4) video recording of the class environment, (5) observation of participants and field notes. In this experimental research, one class of Standard 3 (the equivalent of 3rd grade students) (N=41), were chosen to evaluate the effectiveness of learning the Arabic language through an interactive multimedia environment. To help the participants feel comfortable during the experiment, their regular class teacher was asked to conduct the lessons. Observations showed that the class environment was joyful, as the pupils remained at their stations while learning the Arabic language. There was active participation and the pupils were seen to be co-operative. At the end of the six-week Arabic course, the results of the pre-test and the post-test were compared to ascertain whether there were any statistically significant differences.

Data Collection Procedure

The researcher administered the collection of data personally. In this study, all the tests, questionnaires and interviews were identical. These questionnaires were developed based on the theory of Motivation Test Battery, developed and tested by Wigfield and Guthrie (1997).

Pre-Test and Post-Test

The primary purpose of the pre-test was to determine the level of the students' mastery of the Arabic Language before the experimentation, while the main objective of the post-test was to find out whether there were any statistically significant differences in the final grades of the treatment groups. In this study, the researcher administered identical questions to the treatment groups. The pre-test and post-test contained six sections, each with six questions. The questions included those which required critical thinking and problem solving. The participants responded by filling the blanks, one to one matching, writing the missing words and comprehension. The time allocated for both the pre and post-tests was the same, i.e. 45 minutes. The researcher invigilated the test himself. The pre and post test papers were coded for analysis.

Data Analysis Process

The framework for data analysis in this study was adopted from the work by Miles and Huberman (1994) to describe the major phases of the data analysis. Pre-test, post test, questionnaires, observations, checklists and interviews were coded and made ready for data entry. Based on Miles and Huberman's framework, the collected data were analyzed as follows:

Data Reduction

A combination of deductive and inductive analyses was used to organize the collected data. The data were then categorized based on their relevance and reconfigured for easy comprehension. The crucial data selected and simplified for further reference.

Data Display

Patterns and interrelationships among the collected data were displayed and supporting evidence was matched with the problem statements. The data were then organized from the perspective of the research questions and the hypotheses.

Data Verification

Data conformity and validity were verified. The meaning of the analyzed data was established in reference to the research problem, hypothesis and questions. The data were cross-checked a few times to determine their accuracy.

Results

The main purpose of this experimental research was to critically evaluate the effectiveness of a technology-based learning method to teach Arabic as a foreign language to young learners in Malaysia. The problem investigated in this research was how to improve learners' mastery of the Arab language since many foreign language classes are taught with little or no regard to the current field-tested paradigm of foreign language acquisition. Teachers commonly use an almost outdated paradigm of learning (Krashen, 1987). This situation is unfortunate for the fast learning students who want to acquire knowledge but are deprived of playing a key role in acquiring knowledge (Payne, 2007). Consequently, this research hypothesized that learning the Arabic language through a technology-based environment could significantly increase students' comprehension skills, motivation, satisfaction and enjoyment, thus resulting in better grades.

Pre- and Post-Tests Results

Based on the results obtained from the pre- and post-tests, the students were categorized into three groups, namely good, average and fail, for better analysis.

Table 1. Pre- and Post-Test Performance According to Categories

Categories	Pre-Test		Post-Test		Diff %
	N	%	N	%	
Good	7	17	34	82.92	+ 65.8
Average	12	29.26	6	14.6	- 14.7
Fail	22	53.7	1	2.43	-51.3

Pre-test results in Table 1 indicated that the majority of the pupils, i.e. 22 out of 41 (53.7%) were in the fail category, 12 (29.26%) students were in the average category, while there were only 7 students (17%) in the good category. Post-test results in Table 1 showed that multimedia (BAIK) learners made considerable improvement. The results indicated that out of 41 students only 1 (2.43%) were placed in the fail category, a difference of 51.3%. In the average category, the difference was 14.7 %. In the good category, there were more students; from 7 (17%), the number had increased to 34 (82.92%), showing a difference of 65.8%. It is noteworthy that all the differences were significant.

Table 2. T-test Analysis on Pre- and Post-tests (BAIK)

	Pre-Test	Post-Test	Difference	t	p
Mean	47.49	78.63	31.15	-10.089	0.0001
N	41	41			
S.D.	16.69	13.71	19.77		

The t-test results in Table 2 revealed that there was a significant increase in the participants' final grades in the post-test compared to their grades in the pre-test. (P-value=0.0001; the significant level is 0.050. Since the p-value =0.0001<0.05, the results indicated that there were significant differences in the final grades of learners who were taught the Arabic language using BAIK. The mean score of the students in pre-test was 47.49% while in the post-test it was 78.63%. This result confirmed the available empirical evidence (Singh, 2003), indicating that interactive multimedia helped students to learn effectively

Motivation Result

Observations from this study indicated that learners were motivated to continue learning the Arabic Language in class. About 81.8% (9 out of 11) of the observation checklists were positive. The results indicated that students were eager to learn, as indicated from their facial expressions and their willingness to be engaged in the learning activities. They seemed very satisfied and thus were highly motivated to learn the Arabic language. The results indicated, therefore, that knowledge construction based on a multimedia learning environment such as BAIK was effective.

Table 3. The Students Observation Results

Evaluation Criteria	Responses
1. Did the students enter the class in a happy mood?	Yes
2. Did the students pay attention to the teacher?	Yes
3. Did the students ask any questions during the lesson?	Yes
4. Were the students motivated to learn more?	Yes
5. Did the students remember the lesson and continue to learn?	Yes
6. Did the students remain happy in the class?	Yes
7. Did the students understand the lesson?	Yes
8. Did the students complain about the class condition?	No
9. Were the students confident in the class?	Yes
10. Did the students annoy the teacher?	No
11. Did the students feel important in the class?	Yes

Comprehension Result

It is interesting to note that learners' comprehension skills improved through BAIK, which helped them to learn the Arabic vocabulary in a fun way. The Arabic vocabulary delivery method also helped them to improve the understanding of words. Moreover, sound, pictures, repetition, animations and Malay translation were also used to complement the teaching of the Arabic vocabulary. Such an approach is in line with Mayer's Multimedia Learning Principles which state that students learn better with pictures, animations and sound rather than with words alone (Mayer, 2001). As a result, BAIK helped the learners by using words accompanied with pictures and articulating the words in a narration for better understanding and pronunciation. The games also helped the students to understand new words because they were repetitive and integrated in the games. As a result, mastery of the Arabic vocabulary was successfully achieved without the learners having to memorize the Arabic words. It also shows that the more you repeat your lesson, the more likely it will be remembered. BAIK repeats every lesson before going to the next lesson. This finding is in conformity with that in a study by Webb (2007).

Satisfaction Result

The results obtained from the classroom observation, questionnaires and checklists suggested that BAIK motivated pupils to learn and to continue eagerly learning the Arabic Language in the constructivist classroom. Observations by the researcher also indicated that learners were satisfied with the Arabic Courseware (BAIK) and were confident about learning the Arabic Language.

This was evident from their body language, engagement and excitement in the classroom. According to Keller's ARCS Model, motivation is an important component of any instructional design. Students learn because they are motivated (Barbuto, 2006 & Xiang, et al., 2006).

It was found that students taught through BAIK were satisfied and motivated. BAIK participants are challenged to apply the new knowledge in real life because the activities in BAIK are relevant to their everyday activities. Furthermore, BAIK promotes the concept of rewards and recognition. Studies indicate that rewards and promotion increases learning (Hefer, 2007). Students utilizing BAIK are offered points and rewards to continue learning. Moreover, in BAIK the games and the songs are related to the students' school and constructed in a way that motivates them to continue learning. This is in conformity with current findings which indicate that computer games, songs and stories are excellent modes of knowledge transfer (Cameron, 2006).

The Main Findings of the Research

This research found that students who were instructed using BAIK significantly improved their grades. This is evident from their mean score of 82%, in the post-test compared to 29.26 in the pre-test. BAIK also increased comprehension skills, satisfaction and motivation. It is important to observe that BAIK instruction helped students to improve their critical thinking skills in the post-test. Interviews, general and specific checklists from the students' evaluation indicated that BAIK is an effective courseware for the teaching of the Arabic Language in the Malaysian setting. The results from this study also showed that a multimedia-learning environment such as BAIK motivated learners to continue learning the Arabic Language in the class. Exposure to BAIK improved pupils' performance. These findings are supported by numerous studies in the field of multimedia education (Mayer, 2003), (Clark, 1983). This research also suggests that multimedia instruction designs such as BAIK improves learners' attitudes, satisfaction, motivation and perception about learning the Arabic as a foreign language in the Malaysian classroom.

Conclusion

This study demonstrates that instructional designs such as BAIK, when embedded with the state of the art technology and blended with the latest theories and paradigms of teaching and learning, help students excel in their studies. It is noteworthy that BAIK has succeeded in helping students to understand concepts, increase their satisfaction and motivation in the language classroom, thus helping them to excel in their examination, as reflected in their post-test grades. The findings show that when learners are placed in a constructivist setting utilizing BAIK, they enjoy learning and thus learning becomes more effective.

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