



**Ain Shams University**  
**Women's College**  
**For Arts, Science and Education**  
**Curricula & Teaching Methods Dept.**

**EFFECTIVENESS OF ARTIFICIAL INTELLIGENCE BASED  
ON ADAPTIVE FEEDBACK VERSUS FIXED FEEDBACK IN  
MASTERING AND RETENTION OF LEARNING IN  
MULTIMEDIA COMPUTER PROGRAMS**

A Thesis submitted in Fulfillment of the requirement of  
The M.A. Degree in Education  
(Instructional Technology Specialization)

**Submitted by**

Ayman Gabr Mahmoud Ahmed

**Supervised by**

**Prof. Dr. Abdel-Latif El Gazzer**

**Prof. of Instructional Technology**  
**Vice-dean of the Faculty of Women**  
**For Post-graduate studies and**  
**Researches Ain Shams University**

**Prof. DR. Hanan Mohamed Al sha'er**

**Associate Prof. of Instructional Technology**  
**Ain Shams University**

**College of Women- Ain Shams University**

è è êëç è ç

## **ABSTRACT**

### **INTRODUCTION:**

Instructional Technology has recently witnessed a rapid and remarkable development; that is, it has become the main pillar for developing education in a lot of developing countries as well as the developed ones. It has reached a degree of development that exceeded all expectation due to its numerous capabilities, such as the technology of interactive computer multimedia that are marked by variety, integration, and interaction. It also include several strategies of computer programs, including tutorial programs, drill and practice programs, tests programs, educational database, hypermedia programs, modeling, and simulation programs, and virtual reality, Instructional games, discovery and problem-solving programs, Instructional dialogue programs, integrative multimedia programs, and expert systems programs.

Moreover, research in Instructional Technology has directed toward the use of multimedia in the field of Adaptive Feedback and the Fixed feedback. The feedback is essential to increase the motivation of the learner to learn, to help to correct the responses of learners, and to reach the correct answer quickly, leading to a level of proficiency required. As well it will develop a learner's performance and reduce errors of learning.

It is well established scientifically that feedback plays an important and an essential role in the process of education and human learning, where there is learning easier. Whenever a learner gets information tells him the outcome of performance, whether its true or false, and the provision of such information in an appropriate manner can lead to further learning (Fouad Obouhtab , ١٩٩٦, p. ٥٣٤).

The feedback has a lot of definitions, Chyou defined it as the information provided to the learner by the computer program after the response to the learner (Chyou, ١٩٨٨), and Park (Park, ١٩٩٢) defined it in an old-fashioned way to mean the extent of telling the learner the correctness or wrong answer, and receive screened for information about

the performance after each attempt by knowing the results. Mohammad Khamis (١٩٩٤, p. ٦٧) emphasized that the feedback is the process by which the student recognizes the results of their performance, and enhance correct performances and correct the wrong.

### **RESEARCH PROBLEM:**

The current research problem could be identified in the following statement:

"There is a need to measure the effectiveness of adaptive feedback based upon the artificial intelligence, and the fixed feedback in the multimedia computer programs on mastering and retention of learning."

### **THE RESEARCH PROBLEM:**

The problem of this study has been stated in the following main question:

What is the effectiveness of the adaptive feedback based on the artificial intelligence and fixed feedback in the computer programs on mastering and retention of learning?

This main question has been broken down in terms of the following sub-questions:

- ١ - What are the design criteria should be taken in concern when designing adaptive feedback based upon the Artificial Intelligence and the Fixed feedback in the Multimedia Programs?
- ٢ - What is the appropriate instructional design model (ISD) for the designing adaptive feedback based upon the Artificial Intelligence and the Fixed feedback in the multimedia programs? and how it can be applied?
- ٣ - What is the main effect of the type feedback (Fixed / Adaptive) to designing computer problems course on achievement of knowledge?
- ٤ - What is the main effect of achievement of knowledge (direct / delayed) to designing computer problems course Regardless of the type feedback?

- – What is the impact of the interaction between the type feedback (Fixed / Adaptive) and achievement of knowledge (direct / delayed) to designing computer problems course?
- ٦ - What is the main effect of the type feedback (Fixed / Adaptive) to designing computer problems course on the skills?
- ٧ - What is the main effect of skills (direct / delayed) to designing computer problems course Regardless of the type feedback?
- ٨ – What is the impact of the interaction between the type feedback (Fixed / Adaptive) and skills (direct / delayed) to designing computer problems course?
- ٩ - What is the main effect of the type feedback (Fixed / Adaptive) to designing computer problems course on Program as a whole (achievement of knowledge + skills)?
- ١٠ - What is the main effect of Program as a whole (direct / delayed) to designing computer problems course Regardless of the type feedback?
- ١١ – What is the impact of the interaction between the type feedback (Fixed / Adaptive) and Program as a whole (direct / delayed) to designing computer problems course?
- ١٢ - What is the effectiveness of the multimedia on achievement of knowledge and skills and Program as a whole (achievement of knowledge + skills), more than McGogian effectiveness ratio (٠,٦)?
- ١٣ – Do check with multimedia feedback based upon Adaptive feedback mastery learning ٩٠٪ in post test achievement and post skills and Program as a whole?

### **THE RESEARCH IMPORTANCE:**

This research is considered important in the following aspects:

- ١ - It is considered a response to modern educational trends.
- ٢- It is considered one of the firsts Arabic researches that is concerned with developing multimedia computer programs based on Adaptive Feedback to master learning.

## **RESEARCH OBJECTIVES:**

The study hoped to achieve the following objectives:

- ١ - Determination of design criteria that should be taken in concern when designing adaptive feedback based upon the Artificial Intelligence and the Fixed feedback in the Multimedia Programs.
- ٢ – Developing two instructional multimedia programs in the light of an instructional design model.
- ٣ – Measuring the effectiveness of these programs in mastering learning and retention of learning.
- ٤ - Measuring the efficiency of application of these programs on the developing achievement mastering and retention of learning..

## **RESEARCH DELIMITATION:**

This research has been delimited to:

- ١- A sample of fourth year students, Department of Educational Technology, Faculty of Specific Education in Fayoum.
- ٢ - Computer problems course which is one of the fourth year courses.
- ٣- Applying the ISD model till the evaluation stage.

## **RESEARCH METHOD:**

This research is a developmental research, so the researcher has used the technological method in developing instructional systems in terms of implementing Abdel Latif El-Gazzar's (ISD) model (١٠٠٢). This method includes the analytical descriptive method in the study and analysis stage, and the designing stage, and it applies the experimental method in the evaluation stage, and in measuring the effectiveness of the multimedia programs.

## **EXPERIMENTAL DESIGN:**

The researcher used two experimental groups ٢ Lindquist Type ١DesignX٢ With repeated measurements:

**The first experimental group:** learned with multimedia program based on Fixed feedback.

**The second experimental group:** learned with multimedia program based on Adaptive feedback.

**Repeated measurements:** Direct achievement and delayed achievement.

### **STATISTICAL HYPOTHESES:**

The statistical hypotheses of the study are formulated so as to answer the study's questions as follows:

**First hypothesis:** There is a main effect of the type feedback (Fixed / Adaptive) to designing computer problems course on achievement of knowledge at level ( $\alpha, \beta$ ).

**The second hypothesis:** There is a main effect at level ( $\alpha, \beta$ ) of achievement of knowledge (direct / delayed) to designing computer problems course Regardless of the type feedback.

**The third hypothesis:** There is an interaction effect at the level ( $\alpha, \beta$ ) between the type feedback (Fixed / Adaptive) and achievement of knowledge (direct / delayed) to designing computer problems course.

**Fourth hypothesis:** There is a main effect of the type feedback (Fixed / Adaptive) to designing computer problems course on skills at level ( $\alpha, \beta$ ).

**Fifth hypothesis:** There is a main effect at level ( $\alpha, \beta$ ) of skills (direct / delayed) to designing computer problems course Regardless of the type feedback.

**The sixth hypothesis:** There is an interaction effect at the level ( $\alpha, \beta$ ) between the type feedback (Fixed / Adaptive) and skills (direct / delayed) to designing computer problems course.

**Seventh hypothesis:** There is a main effect of the type feedback (Fixed / Adaptive) to designing computer problems course on Program as a whole (achievement of knowledge + skills) at level ( $\alpha, \beta$ ).

**Eighth hypothesis:** There is a main effect at level ( $\alpha, \beta$ ) of Program as a whole (direct / delayed) to designing computer problems course Regardless of the type feedback.

**Ninth hypothesis:** There is an interaction effect at the level ( $\alpha, \beta$ ) between the type feedback (Fixed / Adaptive) and Program as a whole (direct / delayed) to designing computer problems course.

**Tenth hypothesis:** Multimedia programs based on Adaptive Feedback and fixed feedback achieve effectiveness more than McGogian effectiveness ratio ( $\alpha, \beta$ ).

This hypothesis is divided into the following sub-hypotheses:

(10-1) Multimedia based on adaptive feedback and Fixed feedback achieve effectiveness in the achievement of knowledge more than McGogian effectiveness ratio ( $\alpha, \beta$ ).

(10-2) Multimedia based on adaptive feedback and Fixed feedback achieve effectiveness in the achievement of learning skills more than McGogian effectiveness ratio ( $\alpha, \beta$ ).

(10-3) Multimedia based on adaptive feedback and Fixed feedback achieve effectiveness in the achievement of both knowledge, and learning skills more than McGogian effectiveness ratio ( $\alpha, \beta$ ).

**Eleventh hypothesis:** Multimedia programs based on Adaptive Feedback achieve mastery learning of 90%.

This hypothesis is divided into the following sub-hypotheses:

(11-1) there is a statistically significant difference at the level of significance ( $\alpha, \beta$ ) between the calculated average in post achievement and the degree of mastery learning 90% for the group of adaptive feedback in post achievement.

(11-2) there is a statistically significant difference at the level of significance ( $\alpha, \beta$ ) between the calculated average in post skills and the degree of mastery learning 90% for the group of adaptive feedback in post skills.



(11-3) there is a statistically significant difference at the level of significance ( $\alpha = 0.05$ ) between the calculated average in post Program as a whole (achievement of knowledge + skills) and the degree of mastery learning 90% for the group of adaptive feedback in post Program as a whole (achievement of knowledge + skills).

### **RESEARCH RESULTS:**

- 1- The 1st hypothesis is accepted, since there is a main effect at level ( $\alpha = 0.05$ ) between the multimedia program based on fixed feedback and the multimedia program based on Adaptive feedback on the achievement of knowledge.
- 2- The 2nd hypothesis is not accepted, since there is no main effect at level ( $\alpha = 0.05$ ) between the direct achievement of knowledge and the delayed achievement of knowledge (retention of learning).
- 3- The 3rd hypothesis is accepted, since there is an interaction effect at level ( $\alpha = 0.05$ ) between multimedia programs, and retention of learning (the direct achievement of knowledge and the delayed achievement of knowledge).
- 4- The 4th hypothesis is accepted, since there is a main effect at level ( $\alpha = 0.05$ ) between the multimedia program based on fixed feedback and the multimedia program based on Adaptive feedback on the achievement of learning skills.
- 5- The 5th hypothesis is accepted, since there is a main effect at level ( $\alpha = 0.05$ ) between the direct achievement of learning skills and the delayed achievement of learning skills (retention of learning).
- 6- The 6th hypothesis is not accepted, since there is no interaction effect at level ( $\alpha = 0.05$ ) between multimedia programs, and retention of learning (the direct achievement of learning skills and the delayed achievement of learning skills).
- 7- The 7th hypothesis is accepted, since there is a main effect at level ( $\alpha = 0.05$ ) between the multimedia program based on fixed feedback and the multimedia program based on Adaptive feedback on the achievement of both knowledge and learning skills.

- 8- The 8th hypothesis is not accepted, since there is no main effect at level (0,0) between the direct achievement of both knowledge, and the learning skills and the delayed achievement of both knowledge, and the learning skills (retention of learning).
- 9- The 9th hypothesis is accepted, since there is an interaction effect at level (0,0) between multimedia programs, and retention of learning (the direct achievement of both knowledge, and the learning skills and the delayed achievement of both knowledge, and the learning skills).
- 10- The 10th hypothesis and its sub-hypotheses are accepted, since the multimedia programs based on Adaptive Feedback and fixed feedback achieve effectiveness more than McGogian effectiveness ratio (0,6) in achievement of knowledge, achievement of learning skills, and achievement of both of knowledge and learning skills.
- 11- The 11st hypothesis and its sub-hypotheses are accepted, since the multimedia programs based on Adaptive Feedback achieve mastery learning of 90%. in achievement of knowledge, achievement of learning skills, and achievement of both of knowledge and learning skills.