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Evaluating Model for E-learning Modules According to Selected Criteria: An Object Oriented Approach

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Abstract

This paper aims at developing an applied system to evaluate the e-Learning Modules (eLMs) depending on selected related criteria. Those criteria concern with many fields as well as many factors like, learning theories, computer science, instructional computer, software engineering, educational sciences, language criteria, economical factors, etc. Therefore the authors expressed the term of selected criteria to reflect the meaning of integrated factors of the environment deals with the developed eLM. However eLM for any subject requires for a systematic steps of integrated work depending on the model which is considered by the developer. Mostly the output of a stage represents the input of the next step. Our model will cover all steps in details. Thus such model could be considered not only to evaluate the developed eLMs but it could be used during process of developing because many items of criteria are designed so as to be a guide for developer during development of eLM. Developer should consider eLMs while he/she develops an eLM.

Finally the authors presented selected eLM to apply the evaluating model, outcomes of the evaluations process lead to the needful conclusion.

Keywords: eLMs, eVM (evaluating Model for eLMs), selected criteria

1. Introduction

The approach of designing eVM is technical approach. The author covered all criteria which deal with Teaching/Learning process via e-learning. As the process is instructional process, so theories of learning, teaching methods and teaching strategies were considered. Also the core of the work deals with computer software technologies, so instructional computer criteria and software engineering fundamentals were considered and so on for other fields.

The author's vision is to prove that evaluation process should be systematic and considers all factors deals with the environment of the Teaching/Learning process via e-Learning.

2. Objective of Research

The current research aims at:

i) Developing an evaluating system for e-Learning modules this system was designed depending on standard technical criteria.

ii) Applying the needful system to evaluate selected e-Learning module.

iii) Final conclusion of the current research reflected output of applying the system and general information of the model.

3. e-Learning Modules

In the presented study, we shall consider the following main types of eLMs which exhibit some similarity with existing conventional learning systems. However there are many methods of eLMs but the researcher selected

standard six major methods as shown (Pacific Resources for Education and Learning; ContentCreationWiki; Wikitravel): Tutorial Method, Drill and Practice (Exercices), Problem Solving, Test (e-Exam), Instructional Games, Simulation.

The previous conventional learning methods are described as follows.

3.1 Tutorial Method

In this type of learning, the purpose is to present a new instructional material or to promote current instructional skills of the candidate. So, to achieve such a purpose, there are some steps should be executed according to the following steps:

Introduction → tutorial section → present information → question and answer session (Q & A) → feedback or immediate response.

3.2 Drill and Practice Method

For this type of learning approach, the main purpose is to practicing and enhancement of skills of the learning mind, particularly to grasp the information by solving different exercises e.g. foreign language learning.

Output of tutorial lesson → input of drill and practice lesson.

Accordingly, to achieve such objective, there are major steps should be implemented given by the following:

Introduction → D & P section → select item → Q & A → score → closing → feedback.

Drill and Practice method is suitable for solving problems and practicing exercises like mathematics, statistics.

3.3 Problem Method

This learning approach has a target of testing the student's skills of problem, solving logic and ability to follow direction (algorithm). As it is primarily used to augment higher order of thinking skills, it may activate brain storming of learner.

3.4 Test Learning Method

This method depends mainly on making a quiz where Quiz is designed to test the knowledge or achievement of subjects by learners. To let them know which questions were missed and what the correct answers were (score can be seen immediately). So, achieving such goal requires implementing the following steps:

The output of all other lessons (tutorials, drill and practice, etc) and classroom lesson → input of test lesson.

However there are five kinds of e-exam: multiple choices, matching between words in two columns, fill in blanks, Yes or No and answer in one word.

3.5 Games Method

The main purpose of this approach is to provide an environment that facilitates learning or acquisition of skills. Games however or may not mimic reality. This approach has a major advantage of existing a fun of use and learning under light environment. Achieving this goal imply executing the following steps: Introduction → game section → presentation → scenario → action required → closing → score → system updates → student action.

3.6 Simulation Method

This approach is based on Learning by performing activity similar to real world, useful while learning to use complicated difficult to obtain, expensive machine or pieces of equipment also better used for dangerous activities. Simulation contains an effective mathematical model to process the input data of the learner. The required steps to implement this method are shown in the following diagram.

4. Research Methodology

The Evaluating System in this research represents the core of our work. Thus the author presented the system as a table of three main columns.

The next table represents the needful system of evaluating eLMs according to the technical criteria. The definition of selected criteria in the current paper refers to all factors deal with environment of teaching/learning process via eLM. Therefore the mentioned criteria include factors of computer, learning theories, teaching strategies, teaching methods, etc.

The author considered an object Oriented Approach in classification of the table. The major factor is considered as a class, this class includes selected criteria which are considered as attributes, each attribute includes the needful behavior, that behavior is represented by mechanism of evaluating criterion.

The below table which represents the core of the paper is divided into three columns, the main criterion, sub criterion and the mechanism of applying the sub criterion.

Table 1. The main criterion, sub criterion and the mechanism of applying the sub criterion

class	Criterion (Attribute)	Mechanism of evaluating criterion (Behavior)
Teachning/Learning Criteria	Theories of learning.	Process of teaching/learning eLMs must match the teaching/learning process via e-learning theory/theories like the listed theories: 1) Operant Conditioning Theory (B. F. Skinner) (Learning Theories; Index of Learning Theories and Models; Instructional Design & Learning Theory, 1998). 2) Constructivist Theory (Bruner, 1996). 3) Subsumption Theory (Ausubel, 1971). 4) Cognitive Flexibility Theory (Spiro, Coalson, Fletovich, & Anderson, 1998). 5) Algo–Heuristic Theory (Landa, 1974).
	Teaching methodology	However the previous theories have direct relation with teaching/learning. eLMs should be systematically developed based on certain learning theory/theories. 1) Use suitable teaching method enhanced with reinforcement, immediate feedback and continuous interaction. Besides the required teaching aids for the e-lessons.
Student Level Criteria	experience of the student and Current knowledge/ past experience in the related topic	1) According to learning theories of learning in the previous items, the developer must know current/past experience of student for the e-lessons topic. This task should be acted in analysis stage of eLM. Developer must design his instructional material according to experiences of the student (Ausubel, 1971; Bruner, 1966). 2) Level of presentation material of eLMs for the student must be suitable with teaching methodology, mostly discussion method with interaction is suitable. Suitable teaching methodology allows the student to achieve the objectives of the e-lesson easily and effectively. 3) Level of presentation must be suitable with reading/writing level of the student.
	teaching strategies via eLM	1) Speed of presentation e-lesson must be suitable with level of study for the student. 2) Bring to the student's attention some role, models. Point on that this individual got a head by a combination of effort and by asking for help when needed (Hussein, 2011; Nicholson, 2006). 3) Obtain feedback from your the students at every opportunity as an indicator of the students level of understanding. 4) Presented material in the eLM must be proper with the level of student's language, achievement, culture, and environment.
Instructional Computer Criteria	eLM method (Nicholson, 2006)	1) e-lesson must be suitable with eLM method (tutorial, drill & practice, simulation, e-exam) as shown: Tutorial and Drill & Practice methods are suitable with all levels. 2) e-exam, Dialog and Problem solving are suitable with post primary school levels.

		3) Simulation and intelligent learning are suitable with high level of students. 4) Instructional computer games method are suitable with primary and pre-primary school.
Output Criteria	Visual and audio features (Pacific Resources for Education and Learning; ContentCreationWiki; Wikitravel)	1) Font should be clear, big size, color in opposite to background. 2) Colors should be clear, suitable with subject and without high brightness. 3) Backgrounds should be free from pictures and without visual noise. Also they must in simple and clear colors. 4) Visual and audio noise is important factor because all the instructional material. Therefore all images, pictures, diagrams, charts, texts, labels, video clips, sound files, etc they all must be free from noise. As less as possible of colors, simplified pictures and diagrams clear and meaningful sound. Besides it is better to use simple and friendly pictures,images. 5) Flashing of object is important for some commands to guide the student for next instructional task.
	Multimedia (Pacific Resources for Education and Learning; ContentCreationWiki; Wikitravel)	Multimedia represents the core of eLMs. Therefore it is very important to design technique of multimedia so that to realize the needful goals of eLMs. criteria of Multimedia could be summarize as shown below: 1) Size of pictures which display clips must be suitable size and in clear colors (human engineering) so that the action could be easily recognized by the student. 2) Speed of presenting video clips must be slow so that to be easily traced and understood by the student. 4) The student can repeat playing his desired cuts of video as well as sound files.
Software Development Criteria	Computer Algorithms	1) Easy to access the desired files/data. 2) Run time is acceptable and not sizable of memory. Besides easy access results, outcomes and feedback.
	Software Design for eLMs	Hierarchy of eLM should be built from top of system (Global) to next domain, then analysis into elements and so on, according to S/W Engineering fundamentals. The student while he is using the eLMs needs concentration on output of instructional material. Therefore he could not be asked to do any thing except learning. E-lessons should be easy/flexible to be used by the students.
	S/W language should be of visual programming technique like Visual Basic.net	It is recommended to use visual programming technique like VB.net, because it offers a typical environment to activate the multimedia components and techniques. Also in VB.net, it is possible to link spell checking objects and database. This will help developer to modify their eLMs particularly if eLMs which are generated by Authoring System or Generic Software.
Instructional Computer Model for eLMs	Stages and designing the model	1) The model should be supported by confident and modern theories of learning (as indicated in item 1) 2) The model presents the eLMs with continuous interaction and provide immediate feedback and reinforcement.

General Criteria	Guide and help	1) As the user is student it is better to design eLMs so that to be easy and flexible in using and need not to complex steps of guide and help. Also the help item should be enhancing by pictures, graphics and video files. The student must spend his time for the e-lesson. eLMs should allow the student to select easily his desired instructional item and repeat the e-lesson any time. Also allow him to quit whenever he like and choose any part of eLMs. 2) It recommended that the guide and help are to be activated by friendly pictures and clips within activities of operating eLMs. 3) It is better that the student may use limited keys with mouse only. The student may concentrate on contents of e-lesson not on keyboard keys.
	Output in each screen	It is better that each screen includes output of one objective or on exercise and includes as less as possible of text script and enhancing with friendly pictures and images to support text of lesson.
	Scheduled time for answering or entering data (Hussein, 2011; Nicholson, 2006)	Scheduled time for the student to answer is not preferred. The student must take the chance of enough time to answer or read or enter his information.
Fun and enjoyment	Friendly learning tool (Pacific Resources for Education and Learning; ContentCreationWiki; Wikitravel)	1) eLMs should include fun and enjoyment so that to be friendly learning tool for the student. 2) If eLMs include continuous interaction they give sense of controlling on the teaching/learning process for the student. Therefore the student would take the main/active role in teaching/learning process vie eLMs. Such effective/central role for the student is strongly recommended by modern theories of learning and instructional technology literature.
Economic criteria	Benefit of eLM	Developing eLMs for the students must realize somewhat of benefit outcome. Selected topic, level of eLMs, selected references, level of reading/writing instructional material in e-lessons, etc, they all must realize instructional outcome for the students as well as for schools.
Motivation criteria （Oliver, 2000）	Motivation	eLMs must realize some kind of motivation for the student towards learning. This could be possible by continuous interaction, fun and enjoyment, reinforcement, continuous and immediate feedback.

5. Results and Discussion

In this section the authors applied the System eVM on selected case study then discussed results of applying the system. However the author considered eVM as integrated evaluating System which could be used to evaluate eLMs as well during developing eLMs.

Now consider the print- screen (Figure 1) for an e-learning module to English learning letters and numbers for kids. We will evaluate the concern page according to the above.

Before evaluating process there is a short brief idea about the eLM case study. It is a tutorial eLM has been developed by VisualBasic includes many objects of Multimedia, interaction technique, fun & enjoyment objects, reinforcement, immediate feedback, use systematic eLM method (tutorial method), use a friendly learning tools to the learner, etc.

Well in the Figure 1, the print-screen shows the learning material.

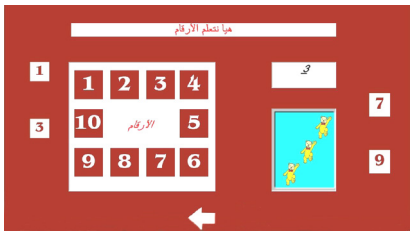

Figure 1. Sample of Print-Screen of eLM (case study)

Most of main items of eVM could be applied on the above print-screen which represents a sample of an eLM.

Item 1. Theories of learning have been considered, Skinner for reinforcement and continuous feedback. Landa, Bruner and Ausubel also have been considered.

Item 2. Also has been considered which has relation with item1.

Item 3. eLM method is very important criterion, eLM must depend on a systematic eLM. In this case tutorial method has been used.

Item 4. Visual features and multimedia are very important to be considered. Multimedia is the core of success an eLM.

Item 5. Software Engineering standard criteria must be considered.

Item 6. There are many selected standard models to develop an eLM. Here is Landa Model was used.

Item 7. General criteria, like simplicity of using eLM, flexibility in practicing,etc. the current case study has used them.

Item 8. Fun and enjoyment were good applied.

Item 9. It is not applied because this project was developed by a student not by a company.

Item 10. The current project was developed so as to increase and enhance motivation of learning towards learning.

Final evaluation of the above eLM could be summarized as shown:

It is a friendly learning tool, enhanced with multimedia objects, immediate feedback and reinforcement were provide to the learner, a systematic model, and learning theories have been considered while developing the eLM, it is simple and flexible, nice visual output are provided, level of presentation and language are suitable to the learner, need less memory and good run-time finally, it is expected that such eLM may increase motivation of learner towards learning as well as provide meaningful learning (Tolman, 1992) and this eLM could be proper with attitudes of learner.

6. Conclusion

The author summarized her conclusion in the following items:

(1) eVM was developed so as to cover all kinds of eLMs and all environments of teaching/learning process via computer. Because target and vision of the author are to cover all factors, elements and criteria of eLM not only computer or software aspect but all features, learning theories, multimedia, motivation, software engineering etc.

(2) eVM could be used to evaluate eLMs as well as could be as standard reference to develop eLM. When developer would like to develop an eLM, he must consider all factors effect environment of teaching/learning process via eLM.

(3) Multimedia is the core of producing eLM because Multimedia effects strongly most criteria of eVM like fun and enjoyment, output features, noise, interaction, reinforcement, etc.

(4) eVM presents an applied approach of evaluating eLMs, This model is aimed to be a typical guide for developers of eLMs so that their developed eLMs help strongly in realizing maximization of instructional outcomes and effective objects as well as realizing the meaningful learning. eVM could enhance the mentioned instructional computer model to develop eLMs. Thus eVM could be a major part of that model.

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