Case Study	AN ASSESSMENT STRATEGY FOR E-LEARNING CONTENT (EMES CASE STUDY)

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ABSTRACT

E-learning environments consist of students, instructors, content, teaching strategies and assessment procedures. Content development is a central part and plays a major factor in the success of the e-learning process. The ADDIE model emphasizes evaluation at every stage; however, it does not specify a reference model or a framework for the evaluation. The goal of this paper is to develop a reference model that assesses the effect of the design of e-content on the e-learning process. This research uses a case study methodology. The case study at a university that practices distance learning for long time and recently moved into e-learning. In this case study, a team of developers is working on producing the e-content under the supervision of university professors subject matter experts. Our objective, in this paper, is to analyze the development process, identify the areas of deficiencies, and develop an assessment strategy to help in controlling the process to produce better quality e-content.

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INTRODUCTION

The major difference between traditional learning and e-learning is the degree of dependence on instructor. Traditional learning has a high degree of dependence on the instructor. The traditional instructor contributes to the learning process by putting together content, developing teaching strategy, delivery of the instruction, and assessment. On the other hand, contribution of instructor in e-learning environment is shifted from delivery of instruction to facilitation and in some cases the instructor is eliminated. For instance, instructor is eliminated in electronic self-learning courses. This change in the role of the instructor plays a significant effect on e-learning content.

The existence of the instructor in traditional learning settings substitute for the weaknesses of the content. During the learning process the instructor may spot-out a weakness in the content (Often books) and may provide a supplemental content or activities to cure these weaknesses. However, this privilege is not available in the e-learning environment. It is the role of the developers of the e-content to expect the hard parts and weakness of the content beforehand and prepare strategies on how to handle these cases.

The developers faces two types of difficulties: the process of expecting the weaknesses and finding solutions for it, and to find out how effective is these solutions. That is why it is very important to involve a long

experienced subject matter expert in the e-content development team.

Therefore, it is very important to assess the content during development stage for many reasons, the most important reasons are cost and time. The cost of developing e-content is much more than developing a paper-based content. The enrichments used in developing e-content cost more than graphs used in books because it contains: sounds, video, multimedia, and interactions. Cost of maintenance of these enrichments is also more than the cost of fixing graphs in books.

That is why assessment is integrated at each stage of the famous ADDIE model (Analysis, Design, Develop, Implement, Evaluate). The objective of integrating the assessment at each stage is to discover weaknesses as early enough in the project. The early discovery of problems reduces significantly the cost of fixing these problems at later stages. It is the same concept in construction project, the cost of finding problems and fixing it during design phase on papers is trivial compared to the cost of finding problems after constriction of the building. Similar to this analogy, is the use of storyboard in the design of e-content. One objective of the storyboard is to help developers visualize the project before it is really built.

The objective of this paper is to develop an assessment criteria as a reference model to help developers in

controlling the process to produce better quality e-content. The paper consist of seven sections. The first section is the introduction. Second section describes instructional design models. The third section defines the effect of learning theories on e-content development. The forth section describes the EMES case study. The fifth section identifies assessment criteria. The sixth section presents the assessment strategy. The last section is conclustion.

INSTRUCTIONAL DESIGN MODELS

Many development models are used by e-content developers. Some have become very popular such as the ADDIE model which consist of five phases: analysis, design, development, implementation, and evaluation. Other instructional design model are adopted by some organization or research projects such as models used in[1,2,3] our case study, ADDIE is the chosen model.

The ADDIE model phases drives the attention that assessment is conducted at the last phase. However, the model does not really recommend that. In fact, the model is circular in its ordering of the phases which means that when it reach the evaluation phase another cycle of phases process should start. The ADDIE model requires some sort of assessment at each phase depending on the nature of the phase but the fifth phase emphasis the evaluation of the outcome of the learning process to give more weight and attention to evaluation.

Another model is the problem-solving approach. In this approach, instructional designers first define the problem they have assigned to address, then propose a solution. For each project, instructional designers should research the background of the learning content, context, and learners before proposing solutions[3].

The approach presented in[2,5] suggests an iterative process for the development of e-content. In this model, designers initially perform quick analysis on the problem, context, and learners. Then they develop a simple prototype of the e-course. Then designers present the prototype to sample representative of learners and obtain their feed-back. This feed-back is used to develop an improved version of the e-course and the process is repeated several times. Therefore, this model combine the need assessment and the design phase together[3].

LEARNING THEORIES

Major learning theories describe how human learn regardless of the delivery mechanisms. Therefore, these theories applies to both traditional domain as well as e-learning domain. Four dominating theories are poplar and therefore used in this paper to develop the assessment strategy: behaviorism, cognitivism, constructivism, and Bloom's Taxonomy[3].

Behaviorism is based on the observable behavior of the learner. Change in the behavior of the learner is the sign of success of the learning process. Many of self-learning packages are based on the behaviorism scholol of thought[3]. Three instructional techniques are based on behaviorism: shaping, operant conditioning, and programmed instruction. The major problem with Behaviorism is that it refuses to acknowledge explicitly perceptions, thoughts, and images[7].

Cognitivism is highly influenced by information processing models. It describes learners process, store, and retrieve information. Cognitivism defines the process of moving information from short-memory to long-term memory. Therefore, it focus on instructions that transfer knowledge to learners in the most efficient way such as: mnemonic devices, metaphors, chunking, and simplification of organization of the content[3,7].

Constructivism is based on learners actively participating and constructing knowledge as they try to make sense of their world. The role of instructor is to direct learners to figure out principles, encourage dialog, and make information accessible to learners[3,7].

Bloom's taxonomy is different from the above mentioned theories. Bloom's taxonomy does not explain the learning process rather it gives a classification of the level of difficulty of the knowledge. Bloom's taxonomy defines six levels for knowledge: know, comprehend, apply, analyze, synthesis, and evaluate. These levels are ranked from easy to difficult. This classification helps content designers to identify the level of difficulty and take the necessary actions to help learners to achieve the learning goals. Figure (1) shows Bloom's taxonomies levels[3].
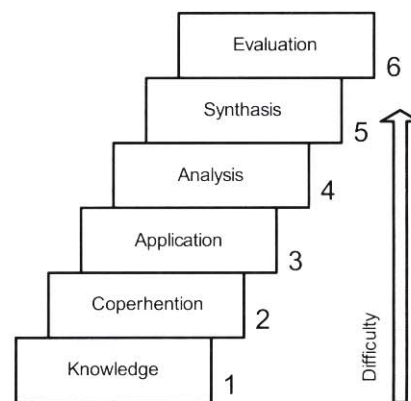

Fig. 1: Bloom's Taxonomy.

THE ASSESSMENT PROCESS

Assessment in elearning is a continues process. Figure(2) shows how assessment relates to each step of

the ADDIE model. The process of assessment is the center of a circular process. At each phase certain assessment procedure has to be applied to maintain the quality of the product as well as to reduce the development cost by avoiding future costly and complex modifications.
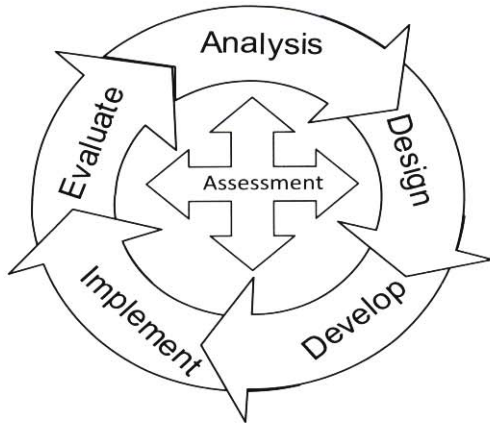

Fig. 2: ADDIE Model.

At the analysis phase, the subject matter expert (SME) determines content requirements according to the problem, context, and learner needs. In the design phase, the SME works out the objectives and the teaching strategy. At the development phase the instructional designer collaborate with the SME to produce the courseware. This stage involves writing down the storyboard and developing learning objects. In practice, a common mistake happens here is that students are not involved in these three phases. Therefore, the assessment process has to consider involving students at this stage.

At the implementation phase the courseware is put in use. During the usage of the courseware students are evaluated formally and informally to determine learning gains and the effectiveness of the courseware.

ADDIE model does not specify how the assessment process is conducted. Therefore, it is up to the involved parties to develop an assessment strategy. Often, e-content projects are let by IT professional. The IT leadership of such project emphasis IT aspects more than learning aspects. Therefore, to avoid such situation education professionals have to be involved in the leadership of elearning projects. In addition, it is necessary also to involve learners as early as possible in the development process to assess the courseware.

The implantation phase in ADDIE is often misunderstood by some developers. They tend to think that the implementation phase is the stage of building up the courseware. The correct understanding of implementation in ADDIE model is the phase where the courseware is put in use. When this misunderstanding happen, users

of the model drop the usage phase of the courseware and the ADDIE model falls short in meeting its objective.

EMES CASE STUDY

The case study used in this research is part of an e-university project. The project consist of three parts: a learning management system (LMS), an e-academic affairs management system called "On-demand university services" (ODUS) and an e-administrative services system. The deanship of distance learning (DDL) is the administrative unit in charge of managing the elearning project.

The LMS project in this case study is called EMES which stands for Electronic Management Educational System. EMES is an e-learning delivery system offers tools such as: syllabus, course description, content delivery, forums, frequently asked questions (FAQ), calendar and news, local email, chatting, assignments, exams, and a download center. All the services offered by EMES are asynchronous services except for chatting is synchronous service.

Figure (3) shows the workflow at the EMES course development process. The process of adopting an elearning course consist of seven stages. It starts from the academic department by nominating a subject matter expert. On the other side the DDL assign an instructional designer (ID) for the course. The subject matter expert meets with the ID and gets the necessary support and training. Then SME starts working on the analysis and design of the course. The work of SME and ID may overlap to reduce the overall time. Once the SME finishes some parts, he delivers it to ID to work on developing the material of courseware.
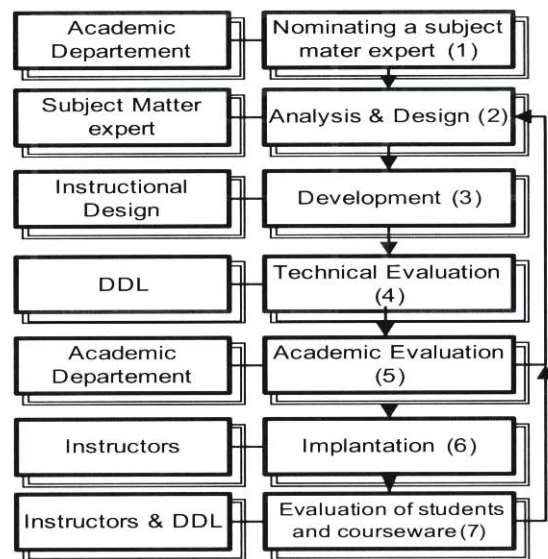

Fig. 3: EMES project workflow.

Stage 4 is a technical assessments process performed by the DDL. A technical team is formed and assigned to inspect the courseware and document any technical defects. Table (1) below[6].

Table 1 : Assessment Criteria.

Behaviorism
- Rate of use of question statement
- Enforcement
- Self-learning activities
- Programmed Instruction
- Self-assessment

Cognitivism
- Rate of use of visual
- Rate of use of sound
- Repetition
- Use of 7±2 objects
- Use of chunks
- Use of mind maps
- Use of mnemonic

Constructivism
- Provide real-world setting
- Encourage reflection
- Pace controlled by learner
- Problem oriented
- SMART Goals
- Interaction activities

Bloom's Taxonomy
- Progressive increase difficulty
- Explicit knowledge level

At stage 5, the package is evaluated by two reviewers who are subject matter experts from the course related academic department. They review the academic aspects of the content. If they agree to the correctness of the package, the package approved for implementation. Otherwise the package go back to the development phase for the necessary fixing. However, if one of the reviewers agree and the other disagree to the quality of the package, then a third reviewer is assigned as an arbitrator.

At the 6th stage the courseware is put into LMS production system for students to use. The course may be used by more than one instructor. All the activities of students and instructors on the courseware are tracked by the LMS.

The evaluation at stage 7 is based on two set of data: data collected from the online activities generated at stage 6 and data collected by users survey. The goal of evaluation is to measure the performance of students and instructors.

ASSESSMENT CRITERIA

Defining an assessment criteria requires identifying the dimensions and the scope of the process. Assessing e-content has two dimensions: technical dimension and academic dimension. The technical dimension consist of technology issues and teaching strategies issues. The academic dimension consist of defining goals, complying with the syllabus and the correctness and completeness of the knowledge provided in the material.

We developed a 20 elements criteria for the learning strategies dimension. Each element represents a feature to be assessed in the courseware. A five points weight is assigned to each feature for the reviewer to use during the assessment process. The criteria is based on the learning theories mentioned above and listed in (Table 1) below[6]. Table (1) presents our assessment criteria.
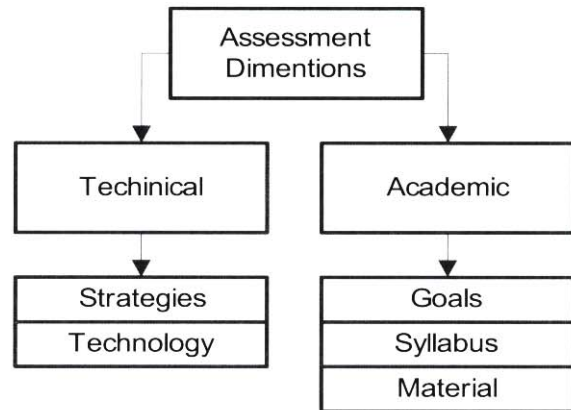
Fig. 4: Assessment Dimensions.

The minimum total point weight required for a course to be approved is undecided in this research. It depends on the problem, context, and the leaner. The objective of the weighing system proposed at this stage is to give a numerical indicator for the reviewers to help them in making the final approval decision.

In the technology dimension four types of components needs to be assessed: text, graphs, media, and packaging. The text has three features: spelling, grammar and style. Graphs has four features: position, size, and clarity. Media has many features. For example sound and movies have to be checked for noise, time and level. Interactive multimedia requires assessment in terms of sequence, scenarios, data validity, and pace. The packaging criteria consist of consistency, integration, length, interface, introductory and termination.

ASSESSMENT STRATEGY

Figure (5) summaries the assessment strategy adopted by the case study. The strategy consist of formal and informal assessment procedures. The first assessment stage (Assess 1) starts at the academic department by nominating a SME. Often the department has several faculty members who are capable of developing the e-content. The department chooses one or more of the most experience members. This is an informal assessment process.

The second stage of assessment is also informal assessment at the analysis, design and development stages. We found it impractical to have a formal assessment at these stages because of the high frequency of iterations which will have severe impact on the development cost and time.
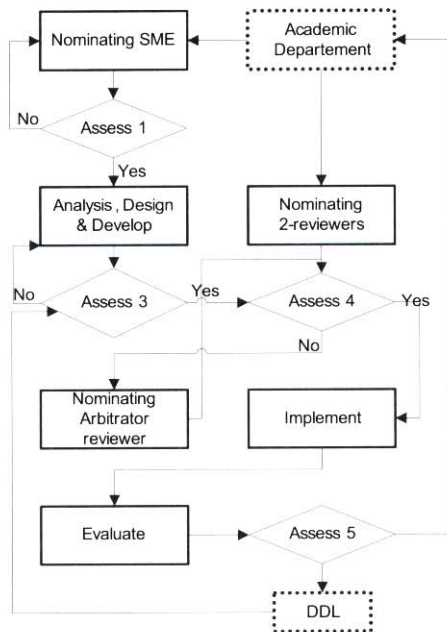
Fig. 5: Assessment strategy.

learning quality and reducing effort and cost. It is hard to invest on developing a courseware and later on through it away because students are not benefiting from it. Therefore, it is very important to enforce a strict quality assurance program to reduce these risks.

This research uses a case study (EMES) to develop an assessment strategy for an e-learning project. The strategy defines a criteria and a process based on learning theory and the experience acquired during the project.

Two issues require future investigations. One of them is designing a numerical system to transform the criteria to a pass or fall decision about the quality of a courseware. The second issue is how a courseware is affected by being used as a supplemental material for learning with other learning resources such as books or field activities. In this case it is very difficult to distinguish between the knowledge learned due to the courseware or due to other learning resources.

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The third stage of assessment (Assess 3) is at the completion of the first version of the courseware. A quality assurance team at DDL assess the technical criteria of the courseware. At this stage the assessment criteria mentioned above is used formally.

At the fourth stage (Assess 4), the academic department chooses two SME as referees to review the package. The SME assigned for reviewing the courseware have to be different from the SME team who developed the courseware. In addition the review process has to be in secret to avoid the negative impact of personal relationships among SME. Those reviewers focus on the academic dimension of the package. They formally check goals, syllabus, and the learning material. Both have to consent on the approval of the package otherwise a third SME is requested to arbitrate the decision.

The evaluation is the most critical part of the assessment. We evaluate students who use the package to measure their learning improvement caused by the courseware. Therefore, it is an indirect assessment for the package through students[5].

The last stage of assessment (Assess 5) is conducted by DDL. At this stage, DDL assess the overall process. They collect the online tracked activities as well as all other assessment reports to produce an overall assessment reports which are used to take necessary corrective actions.

CONCLUSION

Assessing e-learning is very complex process. It is a new field that requires a lot of exploration[8]. The central problem is how to achieve efficiency while maximizing