DEVELOPMENT OF A MULTIMEDIA INSTRUCTIONAL MATERIALS-BASED ON REUSABLE LEARNING OBJECTS IN CONSTRUCTIVIST LEARNING ENVIRONMENT

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ABSTRACT
In the past few years the use of computer technology has been rapidly increasing in almost all spheres of our live. With the advent of rapid proliferation of computers, their use in teaching has also been heightened in an astonishing way. Nevertheless, computer based instruction requires a higher initial investment in budget and time, that is occur when teachers suffer from offering unnecessary duplication in creating the instructional materials. Therefore, the need of adopting new technology that may contribute to the reduction these initial costs and avoid the reinvent the wheel of what already done has been indispensable. The technology is reusable learning objects (RLO), the core element of RLO is the ability of reusability which supports the use and reuse the same RLO within different content and context. This paper focuses primarily upon the design and development of a multimedia courseware based reusable learning objects technology in a constructivist learning environment (MRLO) as a learning mode and attempt to introduce the potential role of this learning mode on (a) English language learning gain scores and (b) perceived motivation towards multimedia instructional among Yemeni first year students of Aden community college.

Keywords: Multimedia, Reusable Learning Objects (MRLO), Constructivist learning environment,

INTRODUCTION
In the current era of globalization and the rush into the information age, computer technology has become indispensable tools in all aspects of our life and can not be ignored by any body. English Education is one of the aspects in our life affected by the advent of rapid proliferation of computers where the students and the teachers tend to obtain the information into fast and simplest way in contrast with the boring books Al-Khawalade (2003). Moreover the term Computer-Assisted Language Learning (CALL) has become buzzword and playing more and more influential roles in the field of English as a Second/Foreign Language (E/FSL) teaching and learning from the outset of used since 1960’s Warschauer & Healy (1998). According to Zhao (2003) in his attempt to addressing the effectiveness of computer technology in language learning by performing a meta-analysis of selected studies published between 1997 and 2001. His study included technologies ranging from video to speech recognition to web tutorials, Zhao found a significant main effect for technology applications on student learning. This consistent with what M.Liu et al., (2002), found in their review of literature from 1990 to 2000 on computer based technology use in second language learning. According to them" Research from 1990 to 2000 provides some evidence on the effectiveness of computer technology on second language learning".

Warschauer (1996) discerned three phases of CALL; each of them corresponds to advances in technology and to pedagogical approaches, in which the computer has been used in language learning and teaching, these phases have moved from (1) Behaviouristic phase conceived in the 1950s and was informed by the behaviouristic learning model, where computer as tutor, serving mainly as a vehicle for delivering instructional materials to the learner, to (2) Communicative phase, emerged in the late 1970s and early 1980s when behaviouristic approaches to language teaching were being rejected at both the theoretical and pedagogical level, Communicative phase of CALL corresponded to cognitive theories,
which stressed that learning was a process of discovery, expression, and development. In this phase computer is used for skill practice, but in a non-drill format and with a greater degree of student choice, control and interaction and (3) Constructivist/Integrative phase, this phase is marked by the introduction of two important innovations: (a) multimedia and (b) internet. The main advantage of multimedia packages is that they enable reading, writing, speaking and listening to be combined in a single activity, with the learner exercising a high degree of control over the path that he/she follows through the learning materials and what makes multimedia even more powerful is that it entails hypermedia. That means the multimedia resources are all linked together and that learners can navigate their own path simply by pointing and clicking a mouse Warschauer & Healy (1998). The internet builds on multimedia technology and in addition enables both asynchronous and synchronous communication between learners and teachers.

Computer multimedia technology as educational tool labeled to be useful in many domain, including foreign language learning Miller (1998), Trollip & Alessi (1988).However the basis for the use of multimedia is the assumption that when users interact with the various media technologies they learn more meaningfully Clark (1983), Mayer (2001), Clark & Mayer (2003). Nevertheless, multimedia based instruction requires a higher initial investment in budget and time Downes (2001), Robinson & Anderson (2002), Toh (2004). To reduce these initial costs and avoid reinvent the wheel of what you have already done, the researchers and practitioners in the education and training area have adopted the ideas of 'object oriented programming' from the computer science area to make the instructional materials reusable Wiley (2000), Jacobson (2001). This relatively new movement has been known as the Reusable Learning Object (RLOs) approach. RLOs are any digital resources that can be reused to support learning. The term "learning objects" generally applies to educational materials designed and created in small chunks for the purpose of maximizing the number of learning situations in which the resource can be utilized Wiley (2002). While there are almost variety definitions of RLOs as researchers and practitioners are offering them. However, RLOs are generally understood as digital learning resources that have potential to enhance learning and to be reusable in multiple of learning context.

While some research has begun to emphasize and dedicate that Reusable Learning objects (RLOs) has the potential of shifting education into another level Wiley (2000), Dowens (2001), Gibbons et al., (2002), Hodgins (2002), many efforts have focused on integrating traditional perspectives on learning based in cognitive information processing and instructional systems design and incorporated these perspectives in the use of learning object systems for increased efficiency of the design and development workflow processes Ritland et al., (2002). But a few empirical researches have been carried out to study the effects of RLOs on students’ learning performance and outcomes Jaakkola & Nurmi (2004; 2005), as well as, the combination of alternative perspectives on learning related to constructivist ideas neither have been considered for application to learning object systems nor been fully explored or developed Ritland et al., (2002).

**PROBLEM**

Yemeni learners have always been reported as weak and low proficient EFL learners see Abbad (1988), Zughoul & Omari (1988), Sahu (1999), Rababah (2003). This situation is highlighted by Al-Fadaly (2004) who states that English language proficiency in fact is a national problem that everybody knows and talks about: teachers, parents, educationists, and the public at large have often passed comments on this. In the same vein Al-Hadad (2005) points out it is not exaggerating to say that this low level of proficiency is so common and easily identified in almost the majority of the students in all their years of study not excluding even those who already graduated. With the exception of very few of them, many cannot express themselves in well-constructed sentences for a few minutes.

Getting to know this problem, it can be evident that there are many factors contribute to the depressing condition of EFL education in the Arab world and particularly in Yemen’s society. Sahu (1999) generally refers to the 3M’s: men, method and material. Zughoul & Hussein (1985) however, state more clearly that the content of university courses is not formed to students’ needs, which are fundamentally determined by the academic departments and the educators themselves. Moreover, Rababah (2003), attributes this more precisely to the lack of
knowledge in English on the part of the school graduates when they join the university, school and English language department curricula, teaching methodology, lack of the target language environment and the learners’ motivation. Al-Raymi (1999) argues since the English language in Yemen is foreign language and the Arabic is the native language of the Yemenis, this may not motivate the Yemeni learners to learn English for they do not need it to communicate in daily situations as in bilingual settings and as a result they may combat the learning of English language Al-Raymi (1999). On the basis of the author’s teaching experience the more factors suit with the Yemen’s situation in general and Aden community college in particular are the teaching methodology and the learners’ motivation since always the teachers in Aden community college heard nagging comments from their students such as “I don’t like to speak English”.

As mention earlier the effectiveness of computer technology on second/foreign language learning has been demonstrated together with the need for RLOs to avoid reinvent the wheel of what you have already done, but the fact that most of research in RLOs focused on instructivist’s conception of learning objects rather than constructivist’s conception of learning objects. However, RLOs has the potential not only to transform education into a new level but also in offer interesting new possibilities to implement constructivist learning environments and engage learners with meaningful learning activities if the ideas of contemporary learning theories take into account with introduced problems in mind Nurmi & Jaakkola (2005). This consistent with the advocators who demonstrate that reusable learning objects are compatible with constructivist and other non-traditional paradigms see Hannafin et al., (2002), Orril (2002), Ritland et al., (2002).

PURPOSE
This paper focused primarily upon the (1) design, development and evaluation of a multimedia courseware based reusable learning objects technology in a constructivist learning environment (MRLO), and (2) to find out the extent to which the Multimedia instruction based reusable learning objects (MRLO) in a constructivist learning environment learning mode could play an important role in improving Yemenis first year students’ gain scores of learning EFL and learners’ perceived motivation towards multimedia instruction.

The following are the specific objectives for this paper:

1. To design, develop and evaluate a multimedia courseware based on reusable learning objects technology.
2. To develop RLO-based constructivist learning environment.

DESIGN, DEVELOPMENT AND EVALUATION
This section describes the instructional design theoretical framework and the activities of the instructional development model that was employed in developing the multimedia courseware based RLO technology.

INSTRUCTIONAL DESIGN THEORETICAL FRAMEWORK
The instructional design theoretical framework reported in this paper provides a solid theoretical foundation in designing guidelines for learning content in a way that enhances and facilitating learning. Therefore, theses instructional design theoretical framework provided guidelines on determining the design of a multimedia courseware based on RLO in constructivist learning environments.

Cognitive Level is an important designation that identifies how the Learner will remember or use the skills and knowledge they are acquiring through learning process Cisco Systems (1999). Thus combining with the learning objective, the cognitive level identifies what the learners is required to remember or do in order to demonstrate mastery of a subject matter. The new bloom taxonomy as proposed by Anderson & Krathwohl (2001) has been adopted in order to classify the cognitive levels. According to Alessi & Trollip (2001) an eclectic combination of objective, cognitive, and constructive approach is most likely to help learners make the progression from being novice to expert learners. Therefore, this approach was
adopted by combining the new bloom taxonomy with the model of designing constructivist learning environments as proposed by Jonassen (1999). This eclectic combination approach serves as one category of organizational strategy which is macro strategy. According to Reigeluth & Merrill (1978) who pointed out that there are two sub-instructional organizational strategies: macro-strategies and micro-strategies. Instructional designers use macro-strategies to organize a set of related skills and knowledge of the subject matter that has been selected for instruction. While micro-strategies are used to organize individual ideas, facts, concepts, principles and procedures, in this paper the principles of multimedia design as proposed in Clark & Mayer (2003), served as the micro-strategy which describes details of how multimedia messages should be designed to promote active learning see Toh (2002). Figure 1 illustrates the instructional design theoretical framework of MRLO.

Figure 1: Instructional design theoretical framework of MRLO

INSTRUCTIONAL DEVELOPMENT MODEL

According to Reigeluth (1999) the instructional development model is processes that the instructional designer should use in order to prepare and develop the instruction. Cisco Systems is very well known company in networking for the Internet. Cisco also is one of the pioneers who have been offered distinguishes effort regarding to design, creation, and deployment of RLOs. It has proposed instructional development model focusing on the use of RLOs Cisco Systems (2000, 2001, 2003a, 2003b). Cisco model based on the traditional ADDIE (analysis, design, development, implementation, and evaluation) model and provides practical implications to instructional designers who are using RLOs in their instructional design. Therefore, the propose learning environment (see figure 2), adopted this Cisco instructional development model in order to develop and evaluate a multimedia courseware based on reusable learning objects in constructivist learning environments. Cisco instructional development model has two major sections: (1) instructional design process and (2) design guide that facilitate micro design of instruction.
This multimedia courseware serves as a learning environment for teaching and learning EFL for Arabic learners in Yemen. The courseware is designed and developed by the author using Macromedia Authorware 7 as main software in development processing of the courseware. In teaching multimedia authoring at university level the most popular candidate authoring tool is Macromedia Authorware (Toh, 2004). According to him

“Authorware meets the constructivist criterion of being an ‘authentic’ environment for courseware development. It is a powerful, real world Multimedia authoring program that can be used to create on-line courseware for the Web or on the CD-ROM.”

As mentioned above the learning environment adopted the eclectic approach by combining the new bloom taxonomy with the model of designing constructivist learning environments (macro strategy) and the principles of multimedia design (micro strategy). Thus during the six phases of Cisco instructional development model (Granular Analysis, Design and Mine, Reuse and Develop, deliver and reference, Maintain for Life and finally Evaluation phase), this strategies have been carried out and serve as main guidelines of designing and development the learning environment by designated the cognitive level via the new bloom taxonomy. The cognitive level was identified as the learner’s ability to interpret their experience in order to pass the tasks that included Expressions of self–introductions and introduce the verb be, Clarify and Check information about people’s name and using titles with names, Forming Wh-questions statement and contractions with the verb be, Subjects pronounce and possessive adjectives.

Since the ownership of the problem is a key for meaningful learning (Jonassen, 1999), the proposed learning environment started with relevant, interesting and engaging problem for the purpose of encourage the students solve the problem. Due to the fact that Jonassen’s model consist of three interrelated components presentation and manipulation problem beside the problem context, the learning environment allow the students to present the problem in two

Figure 2: A screenshot of the multimedia courseware based on RLO in constructivist learning environment depicting the problem context, presentation and manipulation

MRLO COURSEWARE DEVELOPMENT
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ways (reading or listening the problem) and provide students with the opportunity to test their hypotheses which serve as problem manipulate space. Thereafter, learning environments provided students with supported learning tools (related cases, information resources, cognitive tools). Additionally, the learning environment incorporated the principles of multimedia design within the environment such as providing the words with pictures, presenting corresponding words and pictures near, presenting corresponding words and pictures simultaneously, excluding extraneous words, pictures, and sounds. Furthermore, the learning environment has the ability to use and reuse with different content and context which is the core elements of RLOs. In addition the learning environment also capable for tracing and stores complete records of all the students work and activities over the program, allowing teachers to monitor students’ works and evaluate students’ language progress, (see figures 3) which illustrates screenshot for some of the learning environments strategies.

**Figure 3:** A screenshot of the multimedia courseware based on RLO in constructivist learning environment depicting the problem manipulation related cases, information resources, cognitive tools

**MRLO COURSEWARE EVALUATION**

According to Tessmer (1993) who state that formative evaluation has the ability to improve the learning effectiveness of instructional materials. Formative evaluation activities have been initiated in the very early stage of the courseware development with the aim of improve the instructional materials not prove instructional materials just as in summative evaluation process where the evaluation performing at the final stage. The activities of formative evaluation have been accompanied with the design and development of a MRLO courseware as following:
**Expert review:** two experts of related fields such as experience teachers, lectures and instructional designers were invited. The content of the courseware was determined by the expert judgment Gay & Airasian (2003), Mertler & Charles (2005), two English language teachers with more than 7 years of teaching experience were request to review the process used to develop the subject matter of the courseware, two experts in the instructional designers also request to review the process of design and development the multimedia courseware based on RLOs, thus the author adapted and adopted the MERLOT (Multimedia Educational Resource for Learning and Online Teaching) learning objects evaluation criteria module that concentrate on reusability, pedagogy and interactivity for the purpose of MRLO evaluation.

**One to one:** One student at a time was asked to reviews the instructions with the present of the author.

**Small group:** the author carried out a pilot study with group of learners and record their performance and outcomes.

**Filed test:** in the pilot study the author observed the instruction through tracked and stored complete records of the students work and activities over the program.

**CONCLUSION**

This paper presented the need of adopting new technology (RLOs) incorporated with sophisticated theoretical framework as proposed by the author (Instructional design theoretical framework and instructional development model) in order to overcome the traditional instructional design methods requirements of a higher initial investment in budget and time and provide learning environments wherein learners have role in engaged and construct knowledge (meaning making). There has been little study on combination constructivist learning ideas as alternative perspective with application of reusable learning objects philosophy. Nevertheless, nor reusable learning objects neither constructivist philosophy would be a panacea to solve all instructional problems but there is no doubt that both of them separately or merged are an alternative path to enhance learning processing. Moreover this paper proves the feasibility and appropriateness of using the instructional design theoretical framework and Cisco instructional development model as solid theoretical framework for guidelines the design of a multimedia reusable learning objects courseware in constructivist learning environments that presented in this paper or other RLO-based constructivist learning environment. Last but not least the next step which is integral work of this paper is an attempt to find out the potential role of this RLO-based constructivist learning environment produced in this paper on (a) English language learning gain scores and (b) perceived motivation towards multimedia instructional among Yemeni first year students of Aden community college.

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