Open Student Evaluation Model in e-Learning

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ABSTRACT
This research paper aims to present an integrated evaluation model in e-learning systems for students. The paper describes the phases of development and analysis of the application of a web-based open student evaluation model in an e-Learning System. The proposed model has been tested and evaluated in terms of its effectiveness on student communication, collaboration, and progress. The evaluation has showed that the proposed model provides the students with flexible mechanism to control access to their model information.

Keywords
Learning system; e-learning; student model; evaluation; web-based; distance education

1. INTRODUCTION
Developing an e-learning system should be based on learning theory principles and requires identifying how different people learn. Just as engineering is the application of the basic principles of physics and chemistry, and medicine is the application of basic principles of biology, instruction is the application of the basic principles of learning. Therefore, designing an e-learning system or developing an educational software should be based on and should reflect principles of learning theory [1].

According to Anderson (2008) there is no single learning theory to follow to develop an e-learning system; but a combination of theories could be used to develop an e-learning system. Overtime many approaches to learning theory have been formed. Hence, there are many approaches (schools) of learning theory that are in hand [2]. For example, Ryder (1995) mentioned Behaviorism, Cognitivism and Constructivism as the main learning theory approaches [3]. In addition to those, other learning theory approaches are Motivational and Humanist, Design theories and models, Descriptive and meta theories, and Identity theories and Miscellaneous learning theories [3,4]. The following three approaches will be used for the purpose of this research:

1. The Behaviorist psychological approach appeared in the 20th century (Thorndike 1913, Pavlov 1927 and Skinner 1974). According to Anderson (2008), behaviorists focus on observable behavior, indicating that whether the learner has learned something or not is actually located in the learner's mind [2]. The Behaviorist psychological approach viewed the mind as a "black box". That is to say, response "R" to stimulus "S" can be observed quantitatively, totally ignoring the possibility of the thought processes occurring in the mind [5].
2. The Cognitive psychological approach focuses on higher mental processes such as attention, language use, memory, perception, problem solving and thinking [6]. According to Alzaghoul (2014), the Cognitive psychological approach sees the mind as a "black box" that should be opened and understood [5].
3. The Constructivist psychological approach focuses on learners' interpretation of the information and the world according to their personal reality. Such a reality is learned by observation, processing, and interpretation. Then learners personalize the information as personal knowledge, and generate knowledge and meaning from an interaction between their experiences and their ideas. Cooper has explained such knowledge as the experiences of the knower [7,8,9].

The proposed model in this research paper used the three approaches and three individual theories from each approach. The Behaviorist psychology approach focuses on observable behavior [10]. According to Guthrie (1938), all results of learning are regarded as the connection between stimulus "S" and responses "R", which affects the movements on behavior [10]. In this theory, reward or punishment do not play any significant role in learning after the association between stimulus and response has been made. The Cognitive theory suggests that forgetting is due to interference rather than the passage of time; as a result of which stimuli become associated with new responses. This condition can be changed by being associated with responses such as fear or fatigue. The role of motivation is to create activity which produces responses that can be conditioned [11].

In the second psychological approach, Cognitivism, focuses is on higher mental processes such as attention, language use, memory, perception, problem solving and thinking [12]. The learning theory of attribution assumes that people are increasingly turning to determine the cause of what they are doing. People trying to understand why other people did something may affect on one or more causes to that behaviour. Weiner theory identified ability, effort, task difficulty, and the most important factors which is luck could affecting in attributions for achievement. Attribution is classified as three causal: controllability, locus of control, and stability. The main concept of the theory is closely

associated with the concept of motivation [11].The last approach which is used in this research is the Constructivist psychological approach. It focuses on learners' interpretation of the information and the world according to their personal reality, which they learn by observation, processing, and interpretation, as mentioned by Rogers (1969) in his experiential learning theory [13]. It distinguishes between two types of learning: experiential (significant), which is applied knowledge, and cognitive (meaningless), which is known as academic knowledge. The key to the distinction is that experiential learning addresses the needs and wishes of the learner. Rogers describes experiential learning as including personal involvement, self-initiated, evaluated by learner, and as having pervasive effects on learner. Experiential learning is equivalent to personal change and growth. According to Rogers, all human beings have a natural tendency to learn. The role of the teacher is to facilitate such learning. This requires creating a positive atmosphere for learning, which includes clarifying the purposes of the learners, organizing and providing available learning resources, balancing the intellectual and emotional components (of sharing feelings and thoughts with learners, and learning.) It also requires emphasizing the role of students in a learning environment where self-evaluation is the principal method of assessing progress or success [11].Learning styles are simply the different approaches or ways adopted by different learners to learn their subjects. Hence, there is a need to understand these learning styles. Learners prefer to understand any piece of information in their own way such as seeing or hearing, reflecting or acting, reasoning logically or intuitively, and analyzing or visualizing [14].

According to the model results, the styles of learning will change to a new one if it is required to improve the student's results. There are several learning styles' types used by different learners to understand new information. Different models of learning styles exist. David Kolb's model (1984) focuses on four learning styles, namely, accommodating (concrete experience), converging (reflective observation), diverging (abstract conceptualization) and assimilating (active experimentation) [15].VARK model by Neil Fleming (2008) focuses on four learning styles: visual learning (pictures, images, graphs, charts, diagrams, symbols), auditory learning (sound and music), read/write learning and kinesthetic learning, via which learners prefer to learn through experience, moving, touching, and doing [16]. Another model summarizes learning styles in seven points (learning-styles-online 2004):(1) the visual (spatial) style via which the learner prefers to use pictures, images, and space, (2) the aural style (auditory-musical) via which the learner prefers the use of sound and music, (3)the verbal style (linguistic) via which the learner prefers to use words, both in speech and writing, (4) the physical style (kinesthetic) via which the learner prefers to use the body, hands and the sense of touch, (5) the logical style (mathematical) via which the learner prefers to use logic, reasoning and systems, (6) the social style (inter-personal) via which the learner prefers to learn in groups or with other people, and (7) the solitary style (intra-personal) via which the learner prefers to work alone and use self-study [4].

In this paper, the main focus is on the evaluation model to support the e-learning systems. Instructors will be able to enter the values collected for students during class for assessment factors used in this model. The results they get will help view the student evaluation during classes according to those factors. Some results may be accepted by teachers and some may not be accepted since the evaluation shows that the students' evaluation is carried out in a wrong way. Regarding this point, the teacher/instructor should choose a new evaluation style and should distinguish between the old and the new results. Instructors can use more than one style in the same time to achieve the best way to make their students evaluation more understandable, and to increase their assimilation. This research study focuses on social and visual learning styles to develop the proposed system to be used within an e-learning system.The rest of the paper is organized as follows: Section II presents the background of learning root and the role of technology in improving learning; Section III presents the needs for students' evaluation tools; Section IV presents the phase of students' evaluation development and the result of implementing the proposed model; And finally Section V concludes this paper, and presents future recommendation.

2. BACKGROUND OF RELATED CONCEPTS

Learning began with the existence of human beings, and it has taken many forms that have changed over time. In the traditional learning method the classroom and the teacher are the root and the best learning form. For a period of time that was the most advanced learning method. Due to the changes over time, there have been many learning terms and forms which scientists and researchers argue about and use interchangeably till now. The next research sections seek to clarify the differences between these terms and forms as well as indicate the role of technology in learning (particularly with the advancement in information and communication) technology (ICT). Some of these learning terms are: distance learning, e-learning, m-learning, online learning, and flexible learning.

Authors and researchers have defined both distance education and distance learning terms in different ways. King et al. (2001) have stated that there is no difference between both terms and they could be used interchangeably [17]. Open learning systems, telecourse or televised teaching systems, and distance education are similar terminologies that are used interchangeably [18]. Keegan (1996) has said that the term "distance education" is an "umbrella" term, and he has used other terms such as correspondence education or correspondence study, which may have once been synonymously used, which clearly being identified as a potential offspring of distance education [19].The term "e-Learning" is very common and has been used in the last two decades. There are many definitions and terms that exist about e-learning. Such learning has become easier to use through the support of information and communication technology [20]. Li, et al. (2009) have added that "E-learning is the delivery of learning, training or education program by electronic means" (p. 37) [21]. Naidu (2006) and Friesen (2009) have another definition. According to them, e-learning focuses on the intersection of learning, teaching, and education with ICT [22,23].

Online learning terms is education in which instructions and contents are delivered primarily over the Internet. Online learning is a form of distance education [24]. According to Bakia et al. (2012), online learning refers to instructional environments supported by the Internet. Online learning can be fully delivered online or blended with face-to-face interactions [25]. United States Department Of Education

(USDOE, 2007) and Picciano and Seaman (2009) have described that full online learning is a form of distance education in which all instruction and assessment are carried out online; Internet-based delivery [26,27]. Blended learning (also called hybrid learning) (Bakia et al., 2012) allows students to receive significant portions of instructions through both face-to-face and online means [26]. Blended learning is located in the middle of the spectrum between full face-to-face and full online instruction [26,28,29].Mobile-learning (M-learning) refers to a subset of E-learning, educational technology and distance education. M-learning focuses on learning using mobile devices [30]. Crompton (2013) has defined m-learning as learning using personal electronic devices. Learning occurs in multiple contexts through social and content interactions [31]. Bransford et al., (2000) stated that "e-learning" is "supported by digital "electronic" tools and media, and m-learning e-learning" is about "using mobile devices and wireless transmission have emerged."(Milrad, 2003, p. 151) [32,33]. Brown (2003) has explained and summarized the relationship between m-learning and e-learning as indicated in figure-1. M-learning is a subset of e-learning while e-learning is a subset of distance learning, which in turn is a subset of flexible learning. That emphasizes that the term "e-learning" is more comprehensive than the terms "m-learning" and "online learning", which drives more attention towards e-learning [34].

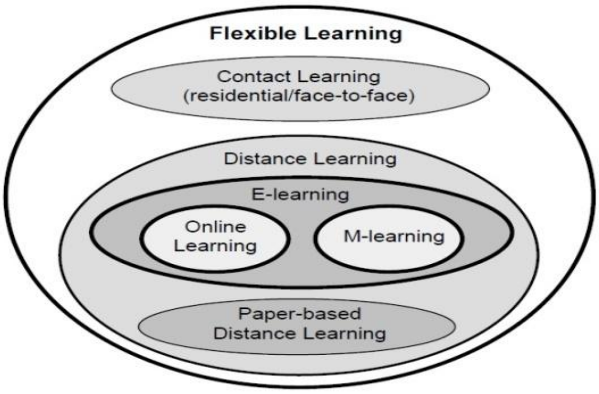

Fig. 1. The Subsets of Flexible Learning (Source: Brown, 2003)

According to Hudson et al. (1997), flexible learning is commonly used with various other terms like flexible delivery, distance learning, resource based learning, open learning and independent learning [35]. Peoples et al. (1997) have noted that flexible delivery is better suited for managing and organizing vocational education and training programs in ways that meet the needs of learners, clients industry and enterprises (cited by Brian, et al. 2003) [36,37]. On the other hand, they considered flexible learning as more specific in learning strategies such as planning, developing and facilitating in order to meet the needs of individual learners.

3. NEEDS FOR STUDENT EVALUATION TOOLS

Distance Education added great advantages of interactive web-based distance education, while teaching activities for centuries have been carried out in forms of lectures since Aristotle's age. It provides learners and teachers with new advantages [38]. Some researchers revealed that education delivered thought learning management systems (LMS) suffers from some problems [39,40,41]. Some of these problems were encountered by students who have studied online courses, including the students' feeling of isolation due to lack of contact with the teacher, disorientation in the course hyperspace, loss of student motivation, and lack of institutional support. To help teachers overcome these problems, some researchers, (Gratto, 1999 and Galusha, 1998), have introduced solutions for monitoring student learning and providing learners with appropriate and prompt feedback [39,44]. Gratto (1999) has recommended having quality web based instruction that should evaluate student products and provide corrective information to the students to learn where their understanding of the materials is faulty [39].Educational research literature shows how monitoring the students learning and progress is crucial in lessons given in classrooms. Cotton (1988) reported that monitoring student learning is an essential component of high quality education [42]. The careful monitoring of students progress is shown in the literature to be one of the major factors differentiating effective teachers and schools from ineffective ones [42]. The same criteria are applicable to online courses as well.

4. THE PROPOSED E-LEARNING SYSTEM

The proposed system is developed to be suitable with the modern technological and frequent use of Web applications. This application is created using MySQL database. MySQL is one of the most efficient databases with the Web applications in hand that speed the emergence of data without barriers or slowing the system [43]. The system has been created to be suitable for any academic system that relies on academic semesters and is linked to academic subjects and deals with many students simultaneously to display their data and progress.

4.1 The proposed model purpose: Analysis

The main purpose of the proposed model is to analyze students' evaluation factors (attendance and grades) by their teachers to be easily used in the future. The model allows teachers to add the subject that each student is enrolled in, with all related attributes for that subjects. Teachers can analyze each semester by subjects, class students or a specific student in a specific subject in order to display the data and progress.

4.2 Design phase

The use case diagram of the proposed system is shown in figure 2. The administrator controls adding data into the system such as courses or semesters. Figure 3 shows the Entity Relationship Diagram (ERD) for the entities in the proposed system. Courses have ID, name, description, semester ID, and a created, modified link with course quiz, semester and session. The system connects the interface of the system with the database to be easily used and has user-friendly interaction.

The tools used to develop the system were compatible with software engineering methodologies. ASP.NET has been used to build a dynamic web application and MySQL has been used for building the Database. Smart Draw and Photoshop software's have been used to design and develop the interface.

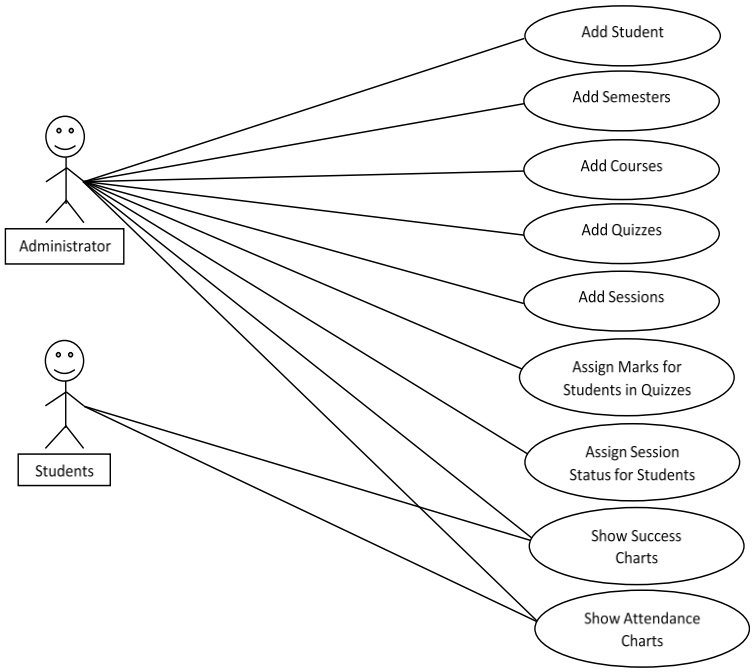

Fig. 2. The Use Case Diagram of the proposed model.

4.3 Evaluation of the proposed model

The developed dynamic web application is implemented in the local environment of the Arab Academy for Science and Technology. It has been used by 16 users, four of which are instructors and 12 are students. After the users accessed and used the implemented web application, a survey was conducted from each user to get their opinion about the usability and performance of the proposed model.

About 62% of the instructors agreed that the functions of the proposed model are positive and are required in the academic cycle to help them evaluate the students. About 80% of the students agreed that the functions of the proposed model are helpful and provided adequate information about their progress evolution. The students could also identify and view the problems with their courses progress, if they existed, in order to improve their evaluation.

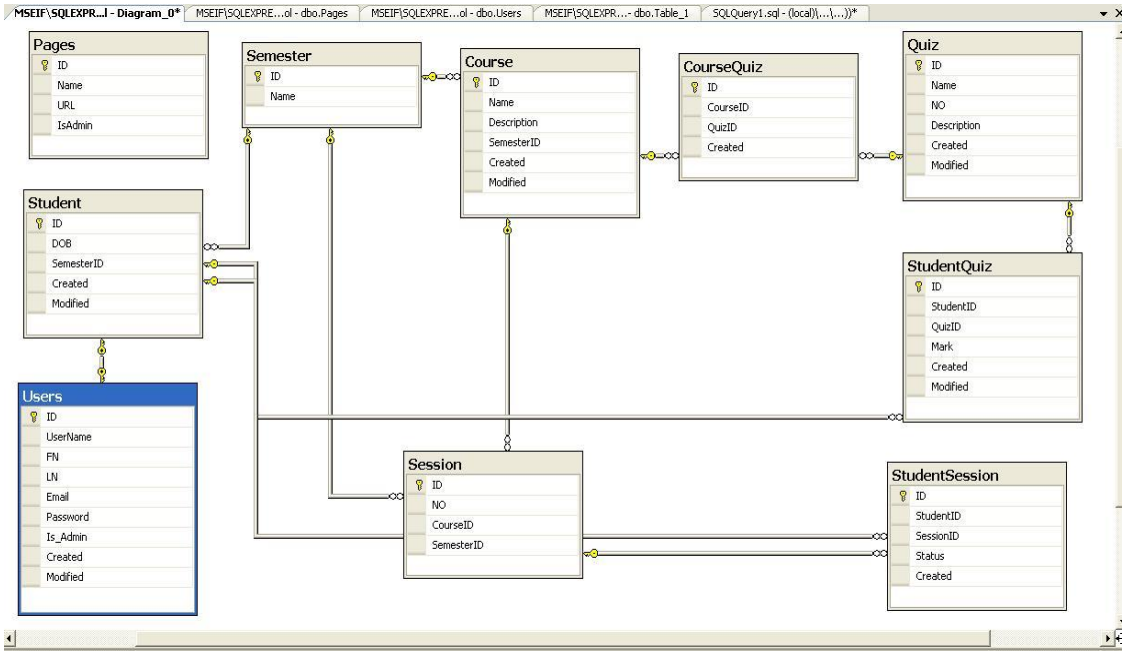

Fig. 3. Entity relationship diagram (ERD) of the proposed system.

4.4 The results of the implementation of the proposed model

Users were able to choose five multiple choices from each factor (attendance or grades), which show the results immediately. This means that any change in the factors will be presented in the chart automatically. The user can make the choice right way for the emergence of ratios as mentioned

Previously whether grades or attendance. The first factor, the grades, has five choices to be presented; (1-all students in all courses, 2- all students in a specific course, 3- a specific student in a specific course, 4- comparing two students in a specific course, 5- a specific student in all courses). The second factor, attendance, can be also measured in terms of five choices; (1-all students in all courses, 2- all students in a specific course, 3- a specific student in a specific course, 4- comparing two students in a specific course , 5-a specific student in a specific courses).

As shown in figure 4, the teacher as a user could analyze the attendance for specific students in a specific course in a specific semester, and view the results in a chart.

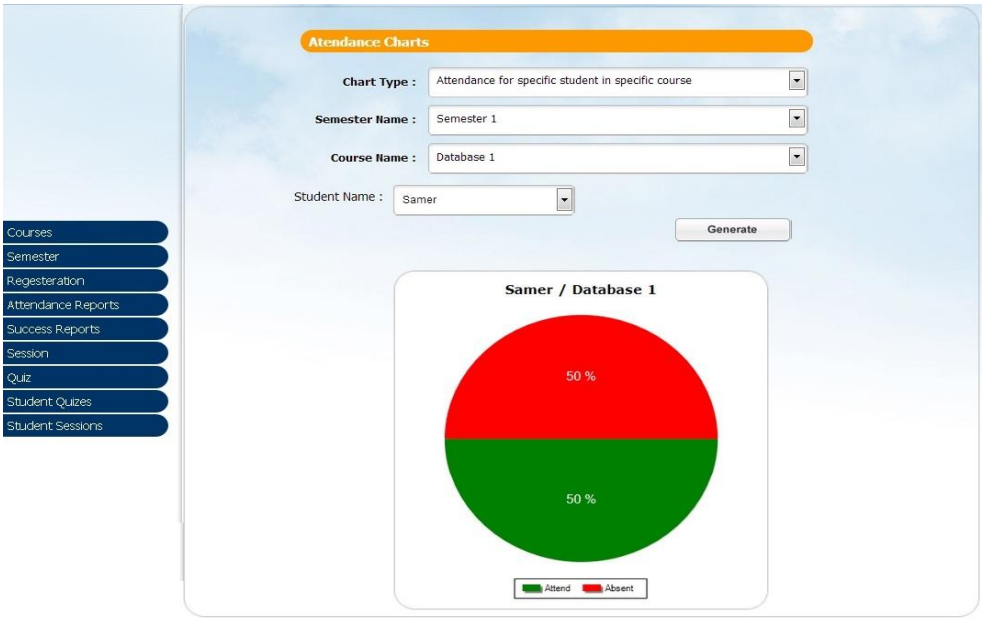

Fig. 4. Attendance for specific students in specific courses in specific semester

Figure 5 shows the success charts by comparing the percentage of success for a specific student in a specific course in a specific semester while also displaying the rest of students' results for the same factors. The results of all charts illustrate the results factor in the green color to indicate a high percentage and in the red color to indicate a low percentage.

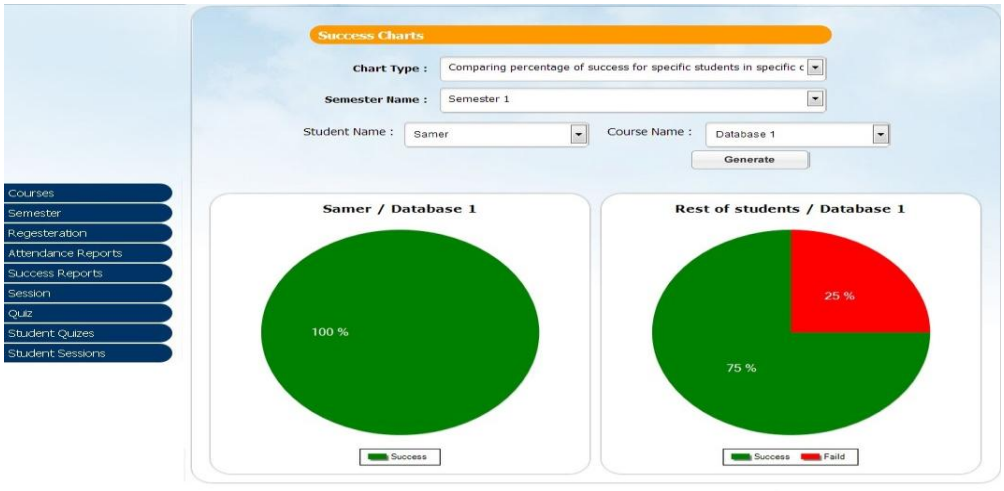

Fig. 5. Success charts for two students in specific courses in specific semester

The system meets the needs of the users to establish self-confidence and to maintain a high level of education that guarantees the lasting success, and help them find out their weaknesses in a timely manner which reflects on their learning improvement.

5. CONCLUSION,RECOMMENDATIONS AND FUTURE WORK

This research paper aims to present an integrated evaluation system for students in e-learning systems. The paper described the analysis and development of a web-based application of an open student evaluation model in an e-Learning system. The paper has proposed a web-based open student model for distance education. The proposed model is developed to be more flexible for students to use in e-learning

environments. The proposed model is tested and evaluated in terms of its effectiveness on student communication, collaboration, and progress. The evaluation has showed that the proposed open student model provides students with flexible mechanisms to control access to their model information.One of the most important extensions planned is the comprehensive privacy management. In this model, the main factors used are attendance and exam results but more factors can be added in the future, such as the student's daily attitude and interaction during class in order to improve the results of the model and accomplish the best performance for instructors during classes.

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