



E-LEARNING TOOLS: GAPS IN CHECKING OBJECTIVE AND MULTIPLE CHOICE BASED QUESTIONS' AGEINGNESS AND NEWNESS

¹PATRICIA KYOMUGISHA, ²Dr. NABAASAEVARIST

MA, Institute of Computer Science, Mbarara University of Science and Technology¹
Deputy Director, Institute of Computer Science, Mbarara University of Science and Technology²
ky.patricia0@gmail.com¹, enabaasa@must.ac.ug²

ABSTRACT

Institutions that offer online learning are mostly embracing objective and multiple choice based questions as a quick and efficient way of assessing learners. In this paper a desk survey was carried out to investigate the existing objective and multiple choice questions in E-Learning tools databases and identify gaps in them; Focusing on the questions' Ageingness and Newness. By Ageingness we mean the time the question stays in the database with or without change and Newness meaning the rate of changing/making changes in the question in the database. Literature about different E-Learning management tools was analysed to find out how Ageingness and Newness of objective/multiple choice questions in the databases is monitored. Several gaps were identified and these include the inability to monitor the time that objective or multiple choice questions spend in the database since the database was created without getting changed, the rate of changing the words within the questions as well as the rate of question usage in the set examinations among others. It was discovered that hardly do these E-Learning tools monitor and report the levels of questions Ageingness and Newness to the users. This situation has highly encouraged cram work by the learners and laziness among tutors who use the E-Learning tools that depend on objective and multiple choice questions for examination purposes.

Key words: Ageingness and Newness, E-Learning, Objective and Multiple choice questions

1 INTRODUCTION

In the wake of the 20th Century, there has been a paradigm shift in learning within higher education institutions towards student-centered learning [7]. According to the researchers in [6] e-learning is described as the use of technology to support and enhance learning practice. Consequently, the adoption of e-learning technologies has impacted on the planning, learning design, management and administration of the learning process and delivery of learning content to the students thereby promoting blended e-learning.

Learning is one of the crucial fields of activity that have benefited from exponential technological development.

The reasons for the increasing interest in virtual education distil down to the achievement of one or more of three basic objectives: one, to increase access to learning opportunities by enhancing the flexibility of delivery modes or by eliminating geographic barriers to participation; two, to enhance the quality of the learning experience in terms of content or pedagogy; and three, to enhance institutional efficiency by reducing costs, increasing productivity or increasing market share [2].

According to the article [1] an E-learning tool/Course Management System (CMS) is a web-based system with a database backend. A CMS assists lecturers in obtaining resources on the web for students and to facilitate the management of course activities and tasks. Some of the common closed e-learning systems available are WebBoard, WebCT, and Blackboard.

From the open source they are: MOODLE, and Sakaiebbased course management systems are: accessibility of course resources to students, timely communication between lecturers and trainees and reduce paper usage (paperless systems)

Objective questions consist of factual questions requiring extremely short answers that can be quickly and unambiguously scored by anyone with an answer key, thus minimizing subjective judgments by both the person taking the test and the person scoring it.

Multiple choice questions are a form of assessment in which respondents are asked to select the best possible answer (or answers) out of the choices from a list [1].

2 Related Work

In this section we reviewed literature related to e-learning objective and multiple choice based questioning in e-learning tools databases

2.1 Web-based “QuestionsBank” System to Improve E-Learning Education in Qatari School

In this research [3] the researchers focused on a web based “questions-bank” system, which can be used with any school courses and may save hours in examinations and quizzes preparation and correction, as well as may save resources like, photocopying and distributing the examinations papers, locations of these examinations, teachers and assistants. The system proposed has the following functionalities and features:

Knowledge evaluation

Students can evaluate their understanding levels and teachers can track the activities of their students and can guide them to reach the pre-determined objectives of the courses.

Examinations generation

Teachers can store many types of questions like multiple choices, true/false and fill in the blanks. The system uses an intelligent algorithm to generate balanced exam sheet, that containing different types of questions, covering the entire curriculum and displaying gradually from easiness to difficulty.

Exam grading

Quizzes and exam can be marked automatically by the system. Thus, students can get instantly their marks in a given quiz immediately after submitting their responses and see also the corrected answers.

Communication

The system has a communication tool that allows students and teachers to interact together and discuss their activities.

Course management

The system is highly flexible and doesn't necessitate any programming skills from its potential users. Thus, teachers can add, delete and update their course materials at any moment through the web.

Questions-Bank database

The system allows the schools to create a Questions-Bank database that stores the previous examinations, the model answers, the reviews and useful exercises for each course.

System overview

The system interface is entirely web-based and doesn't necessitate any technical skills from the potential users. The system is divided into three applications, called administrator, teacher and student application. As shown in Fig.1.1 below, the system is appropriate for on-campus teaching, with access to the Internet, or off-campus teaching using the local network.



Figure 1: System overview (source [3])

The administrator application; This application provides the school administrator with simple tools to manage the information of the Questions-Bank system. The following are some features provided by the administrator application:

- (i) Activate/Inactivate the system
- (ii) Import and Export the questions-bank database
- (iii) Send automatic email immediately containing the new password whenever the user changes his/her password
- (iv) Administer the basic information of the system such as: Levels data, subjects or courses data, classes' data, teacher's data and students' data

The teacher application; This application provides the teachers with various tools to construct the system



services. The following are some features provided by the teacher application:

- (i) Change account password
- (ii) Manage (add, update, delete and display) all the system services (reviews, exam questions, quizzes, previous examinations and model answers)

The student application; This application provides the students with interactive tools to use the services of the system. The following are some features provided by the student application:

- (i) Change account password
- (ii) Download assignments, revision documents, previous examinations and other files that are uploaded by the teachers
- (iii) Take web-based quizzes, examinations, assignments, interactive tutorials and reviews

Database design; The researchers in [3] specify that Microsoft SQL Server database was the database management system used for the system. The implementation of the database was developed and modified many times to be applicable with the system requirement.

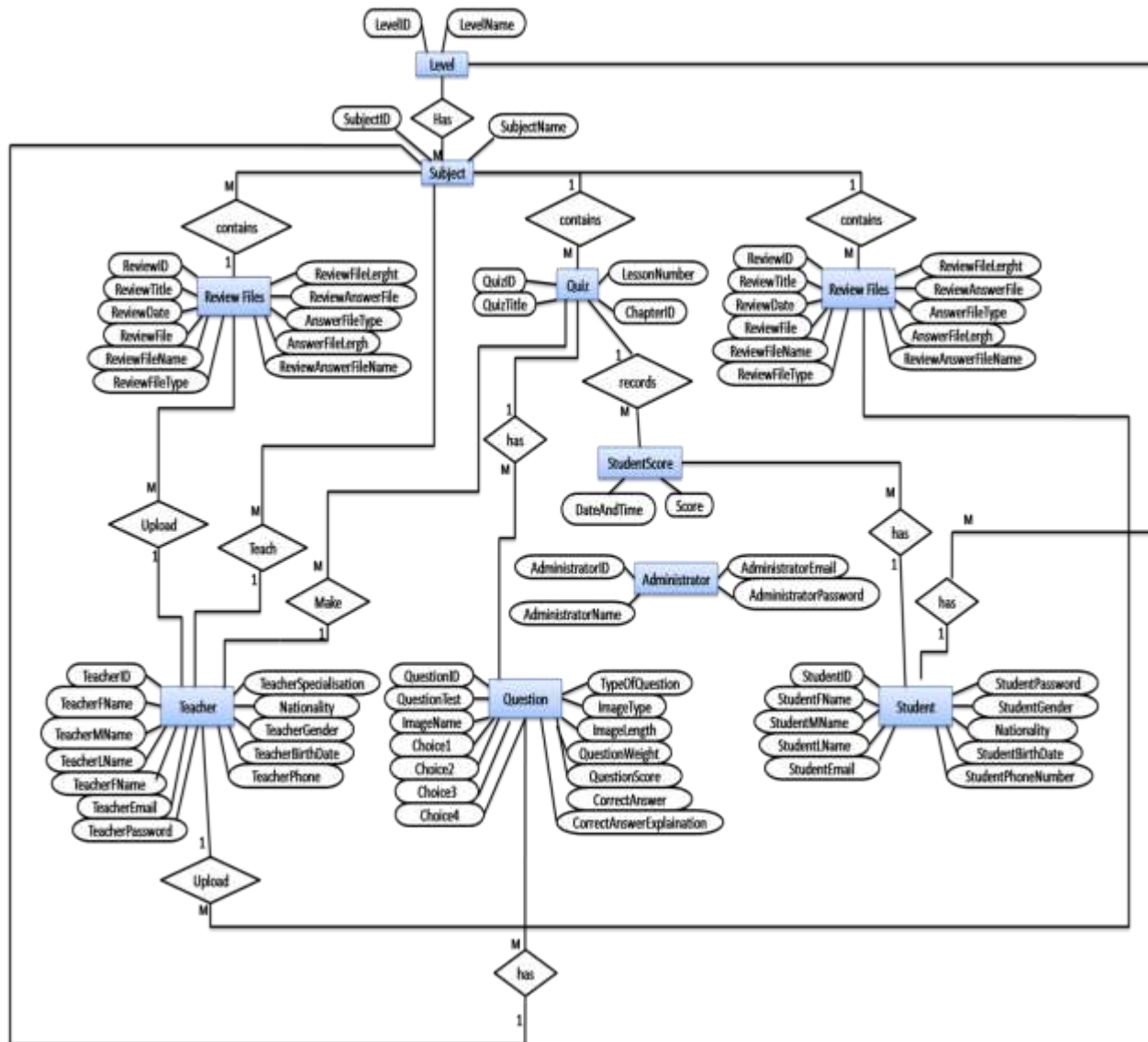




Figure 2: The basic Entity Relationship Diagram (ERD)(source [3])

The Database Management System stores the subjects in each school level, the reviews, the previous examinations, the examinations, the quizzes, the student grades and the basic information of the administrator, teacher and student. They chose the entity-relationship model to represent the database design [4] The Figure above shows the basic entity-relationship diagram, that contains the main tables used for creating the Questions Bank database.

Conclusion

It has been noted that among the responsibilities of the administrator managing the question bank system it's not stipulated that there is any kind of monitoring of the ageing and newness of questions in the database. Therefore there is need to develop a model for checking ageing and newness of objective and multi choice based questions in such an e-learning tool

2.2 E-Learning System Using Service Oriented Architecture (SOA)

The researchers in [10] focused on implementation of e-Learning system using Service Oriented Architecture uses services; login service, question service, scrap service, upload service, remove service, exam service, course manage service, exam question service.

Exam question service; This service allows the teachers to give a large dataset of questions to the students.

The two operations associated with this service are postQuestion and updateQuestion. Teacher can post any question of any of the specified subject. The questions are of multiple choice type (MCQ) each question is followed by 4 options. Only one of the options is correct. The answer is also provided along with the question. The teacher can also update the question if the requirements specify. The student at any time can view the entire set of questions provided for any course available in the system.

Question service; The service provides two operations namely submitQuestion and answerQuestion. submitQuestion allows the student to post their queries about any subject or course which is provided by our E-Learning system. Each question post is associated with the date of questioning and the name of the student raising the question. Similarly, the second operation answerQuestion allows any teacher or any other student logged into the system to answer the question. Each question can be given numerous answers. Answers are also associated with the date of the answering and the user who gave it.

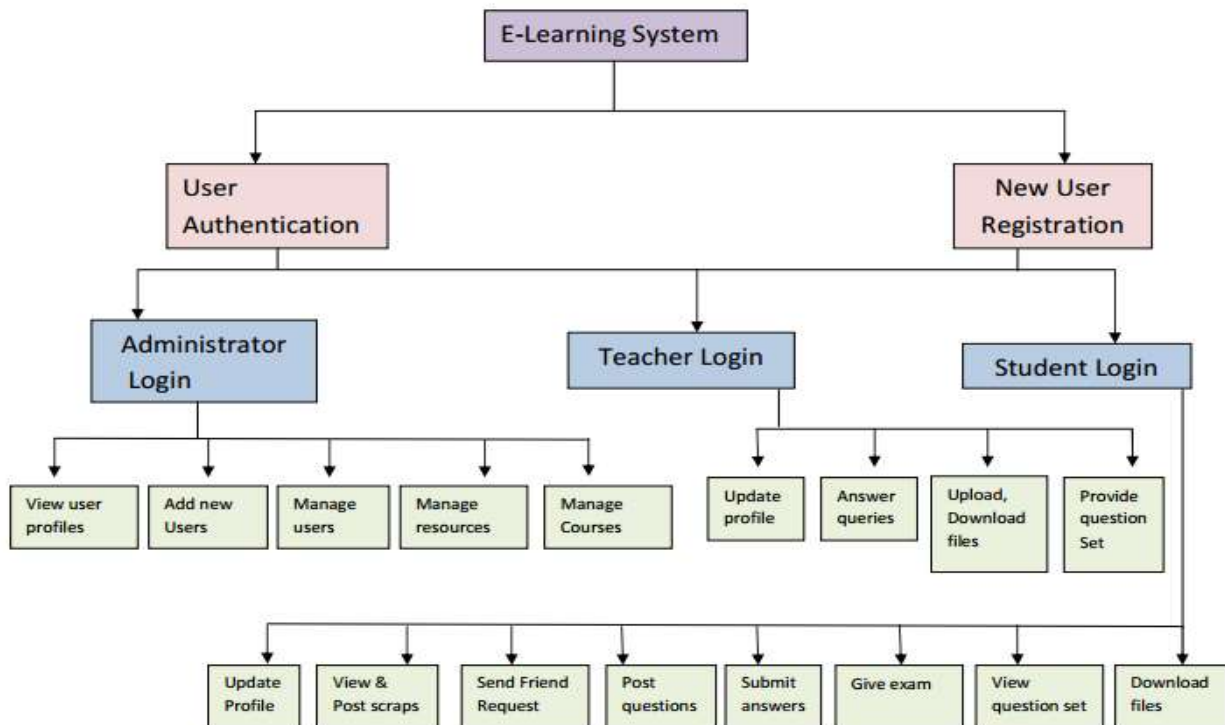


Figure 3: Functional Decomposition Diagram (source [10])

The system provides administrative services, faculty services and student services. The system provides numerous numbers of features for students as well as for the faculty. Along with scrap sending feature, the system also provides Chat feature for communication between students and faculty. The ELearning system which was built acted as an interactive media between the teachers and the students. The system acts as a forum where transfer of knowledge takes place [10].

Conclusion

The architecture allows the teachers to give a large dataset of questions to the students. This operation is associated with being able to post a question and update a question. On the other hand from the Functional Decomposition Diagram above it is not clear how the system tracks that the questions in the system are indeed updated. Therefore there is a need to develop a model that will track and check the age and newness of the questions so as to better the learning.

2.3 Intelligent Question Bank and Examination System

According to researchers in [5] the key aspects of the question model include an intelligent questioning engine, a question or answer interface tool and a connection to a knowledge database to monitor student progress.

The question model is a representation of the question database that is developed for each module in a course for a program of study. Each question is characterized by type (true/false, multiple choice, numerical answers), weight, as determined by the difficulty level, and a knowledge key that defines the scope of the question and its coverage of the knowledge map.

After each question is answered, the question management system then updates the student's progress through a knowledge map, again taking into account the question characteristics.

Fig. 4 below shows the Intelligent Questioning System concept. The Intelligent Questioning System is comprised of two basic components: the knowledge module and the question module [11]. The knowledge module presents the user with his or her current level in the system.

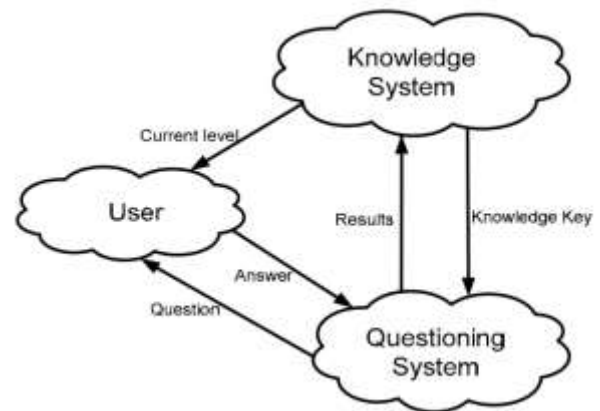


Figure 4: Intelligent Questioning System Concept (source [5])

The questioning module then identifies an appropriate set of questions within this level. A question is then randomly selected and presented to the user. When the user completes an exam, the questioning module provides an assessment measure to the knowledge module. Fig. 5 below shows the questioning module architecture. The knowledge module then updates the user's status in the system.

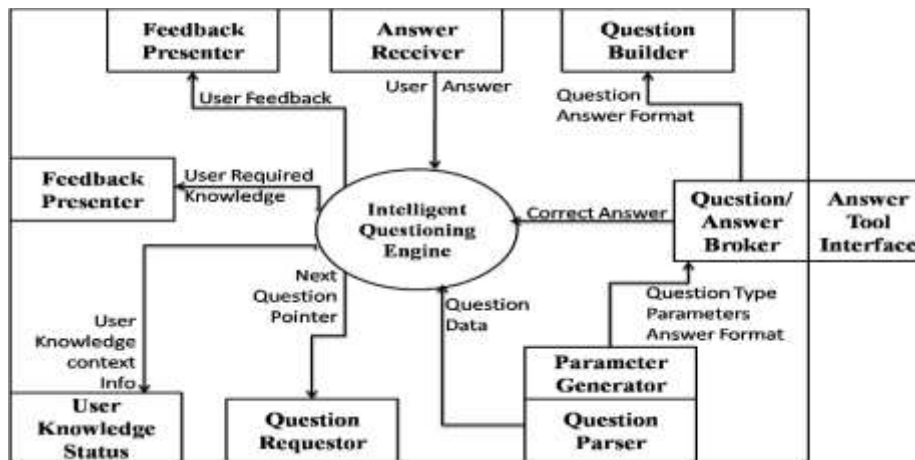


Figure 5: Questioning Module Architecture (source [5])

The questioning process involves: randomly selecting a question from the set, completing the question, gathering assessment information, and providing a measure of the degree of understanding back to the knowledge model for use in knowledge assessment. Besides selecting and asking a question, the question set also provides a mechanism to quantify degree of understanding. This is used to assist in assessing the students level of competence in each topic.

Conclusion

The researchers noted that a question database for each module in a course for a program of study was developed however there is no specification of how often the database is updated, thus indicating that similar questions will be recycled and examined many times. This limits the learners that use this system from acquiring more knowledge given that same questions are asked over and over again. Therefore this calls for the need to track and check the ageingness and newness of the questions so as to better the learning.

2.4 Multiple choice question Database

The multiple choice question type stores both the order of the choices and the selected choices in the answer field of the quiz states table. Storing the order is optional (mainly to provide backward compatibility with previous versions of this question type). The order is stored as a comma separated list of answer IDs (primary keys from the quiz answers table). It is separated with a colon (':') from the selected responses, which are also stored as a comma separated list of answer IDs. For example 1, 3, 2, 4:2, 4 means that the answers were shown in the order 1, 3, 2 and then 4 and the answers 2 and 4 were checked. Note that the list of selected responses is usually shorter (and often contains only one id) than the list that provides the order [9].

An important consideration in constructing multiple choice items is to make them measure learning rather than test-taking skills of test wise students [8]

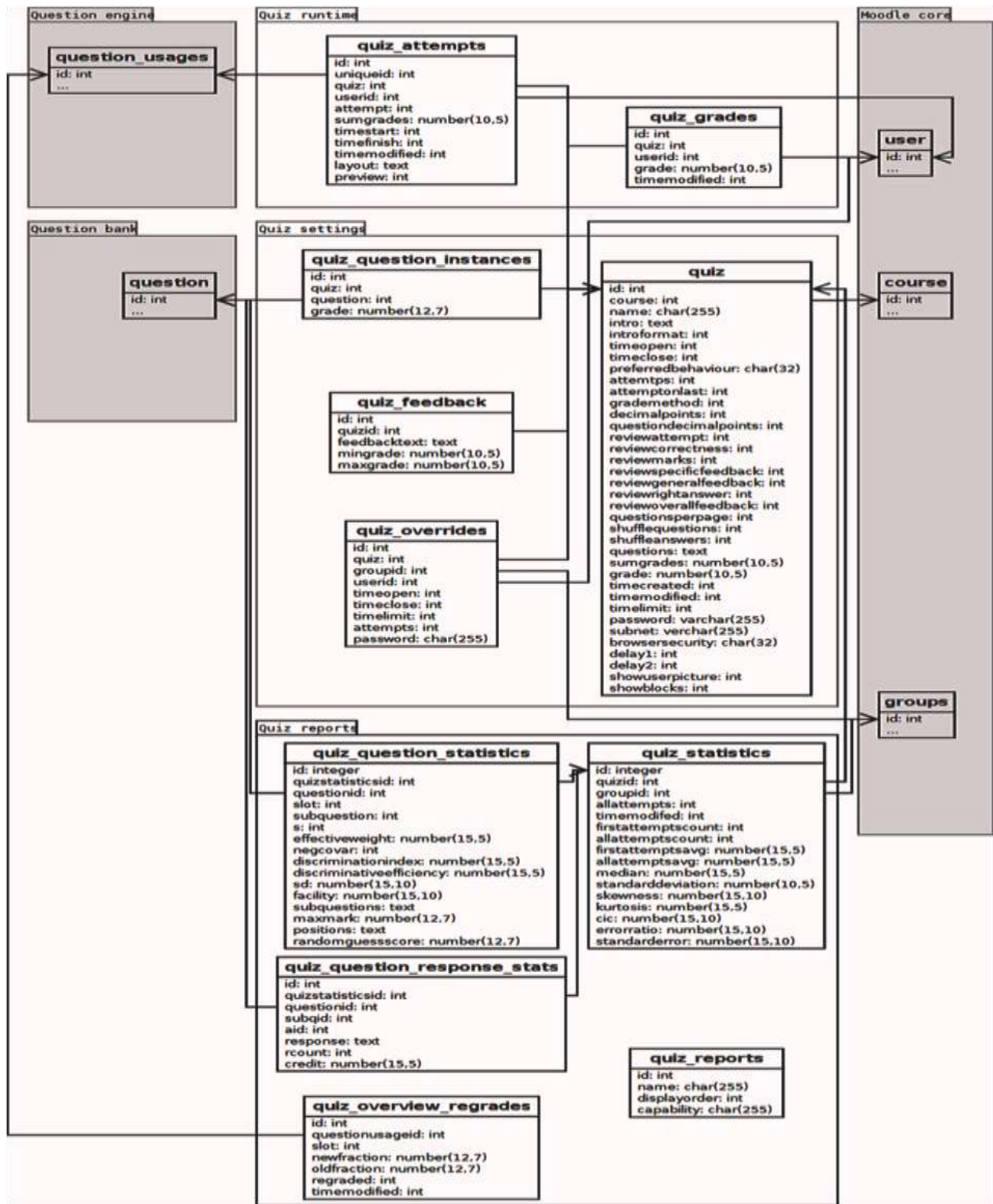




Figure 6: Quiz database structure (source [9])

Quiz settings and runtime overview is helpful to distinguish between quiz settings, which where information about how the teacher has set up the quiz is stored, and 'runtime' is where information about people's attempts at the quiz is stored.

3 Analysis and Results

Institutions that offer e-learning studies are mostly embracing objective and multiple choice based questions as a quick and efficient way of assessing learners. Among the e-learning tools looked at in this paper there are several gaps identified in relation to capturing the ageingness and newness of the objective and multiple choice questions used in assessing learners.

3.1 Identified Parameters

We find these parameters crucial in determining the Ageingness and Newness of the objective and multiple choice questions in e-learning tools databases.

Parameters identified include:

(i) Change of words in the question is monitored: When words in the question are changed the approach to the question changes. According to table 1 below 100% of the explored tools do not change the words in the questions unless the curriculum has changed but we know that curricula changes after a long time.

(ii) The whole question is replaced before the curriculum changes: From table 1 below 100% of the explored tools do not replace the whole question before the curriculum changes.

(iii) No changes to the question at all: When no changes are made to the question that means the question is not updated. According to table 1 below 100% of the explored tools do not make any changes to the question at all, unless the curriculum changes.

(iv) New questions just added to the database before curriculum change: When new questions are just added to the database it means that different questions may be added. According to table 1 below 100% of the explored tools do not add new questions to the database before the curriculum changes.

(v) Time spent in the database by a given question with or without change is monitored: When time spent in the database is not monitored, it means that the date and time when the question was put in the database is not known. From table 1 below 100% of the explored tools do not monitor the time questions spend in the database with or without change.

(vi) Marks of the same question can change when resetting it: When marks of the question change, it gives the learner an opportunity to explain more or less depending on the marks given. From table 1 below 100% of the explored tools the marks of the same questions do not change in the different sets of examinations where the same question is set.

(vii) The same question is not reset in different sets of examinations: When same question is not monitored in terms of it being reset in different exam sets, it means that learners will give same answers as in the previous set of exam as a result cramming is highly encouraged. From table 1 below 100% of the explored tools indicate that same question can be reset in different sets of examinations and given to the learners.

(viii) Questions change with new curriculum: Usually when the curriculum changes the questions are also changed. According to table 1 below 100% of the explored tools show that questions only change with change in the curriculum. This is only good for tools whose curricula changes in a short time.

(ix) The rate of setting the same question is monitored: When the rate of setting the same question is monitored, this helps to know how often the question has been set. From table 1 below 100% of the explored tools show that the rate of setting the same question is not monitored. The same questions can easily be over set than others.



E-learning tools looked at	Parameters								
	Change of words in the question is monitored	The whole question is replaced before the curriculum changes	No changes to the question at all	New questions just added to the database before curriculum changes	Time spent in the database by a given question with or without change is monitored	Marks of the same question can change when resetting it	The same question is not reset in different sets of examinations	Questions change with new curriculum	The rate of setting the same question for different sets of examinations is monitored
Web-based "Questions-Bank" System to Improve E-Learning Education in Qatari School	NO	NO	YES	NO	NO	NO	NO	YES	NO
E-Learning System Using Service Oriented Architecture (SOA)	NO	NO	YES	NO	NO	NO	NO	YES	NO
Intelligent Question Bank and Examination System	NO	NO	YES	NO	NO	NO	NO	YES	NO
CICICO	NO	NO	YES	NO	NO	NO	NO	YES	NO
Moodle	NO	NO	YES	NO	NO	NO	NO	YES	NO
Microsoft certification	NO	NO	YES	NO	NO	NO	NO	YES	NO
ATutor	NO	NO	YES	NO	NO	NO	NO	YES	NO
Pearson OpenClass	NO	NO	YES	NO	NO	NO	NO	YES	NO
TOEFL (edx)	NO	NO	YES	NO	NO	NO	NO	YES	NO
Claroline	NO	NO	YES	NO	NO	NO	NO	YES	NO



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Table 1: Identified Parameters and their application to in different e-learning tools

4 Conclusion and Future work

In conclusion therefore, this paper presents the gaps in checking objective and multiple choice based questions' ageing and newness. Given the findings as shown in table 1, it was identified that less has been done on monitoring the ageing and newness of multiple choice and objective questions in e-learning tools databases. This therefore has inspired us to propose our next research activity which will be design and development of a model that will monitor Ageing and Newness of Objectives and Multiple Choice questions in E-Learning tools databases by considering the identified parameters. After achieving this, e-learning tools that depend on objective and multiple choice questions for examination purposes will be greatly improved.

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