



The investigation of the Effect of using E-learning in Database Course by using Moodle

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Abstract

Despite the proliferation of E-learning in education world-wide, this methodology is not implemented on Libyan context. therefore, there is a need to investigate the effect of deploying eLearning methodology in higher education. The aim purpose of this study is to develop E-learning database by using Moodle open source (learning management system). The secondary purpose is to compare the effects of two different modes of teaching (E-learning, and traditional classroom) on student achievement used in database course at (High institute of medical technology Abosalim).

A study was developed to examine student's achievement in database course by comparing results of final test for both modes of delivery. The sample was (16 students at classroom mode and 15 students at E-learning mode). The final results showed that the mean difference between the test of the two groups by using the T.test was that the E-learning group obtained a higher achievement of statistical significance than the traditional education group at the significance level ($P < 0.05$). These results indicate that database E-learning course is well-designed and can be very effective for students' achievements.

Keywords : E-learning; Database; Teaching; Moodle

ملخص

على الرغم من انتشار التعلم الإلكتروني في التعليم عالمياً، إلا أن هذه المنهجية لم تُطبّق في السياق الليبي. لذا، ثمة حاجة لدراسة أثر تطبيق منهجية التعلم الإلكتروني في التعليم العالي. يهدف هذا البحث إلى تطوير قاعدة بيانات للتعلم الإلكتروني باستخدام نظام إدارة التعلم مفتوح المصدر "مودل". كما يهدف أيضاً إلى مقارنة أثر نمطين مختلفين من التدريس (التعلم الإلكتروني، والتدريس التقليدي) على تحصيل الطلاب في مقرر قواعد البيانات في المعهد العالي للتكنولوجيا الطبية أبو السلام.

أجريت دراسة لفحص تحصيل الطلاب في مقرر قواعد البيانات من خلال مقارنة نتائج الاختبار النهائي لكلا نمطي التدريس. شملت العينة 16 طالباً في نمط التدريس التقليدي و15 طالباً في نمط التعلم الإلكتروني. أظهرت النتائج النهائية، باستخدام اختبار T، أن متوسط الفرق بين نتائج المجموعتين كان ذا دلالة إحصائية، حيث حققت مجموعة التعلم الإلكتروني تحصيلاً أعلى من مجموعة التعليم التقليدي عند مستوى دلالة ($P < 0.05$). تشير هذه النتائج إلى أن دورة التعلم الإلكتروني القائمة على قواعد البيانات مصممة بشكل جيد، ويمكن أن تكون فعّالة للغاية في تحسين تحصيل الطلاب.

1.Introduction

Traditionally teaching has been performed by face to face style presentation and interaction. This requires the learner and the instructor to be in physical proximity [1], [2], [3]. The cost of providing this type of teaching has become expensive, as it requires the learner to spend time away from the workplace combined with travel and accommodation costs [4], [5], [6]. An alternative to face to face presentation is e-learning. Teaching can take place at a suitable time and location for the learner while the instructor can be an expert located anywhere in the world [7], [8], [9], [10].

The Information and Communication Technologies (ICTs) play an vital role in education, having a special relevance in the instructional component, supported by Learning Management Systems (LMS) [11], such as Moodle. However, these platforms have many capabilities provided that they are used in their fullness [12], [13]. For example, interaction, feedback, conversation and networking are some of the possible actions using learning platforms. Furthermore, they provide a lot of opportunities to explore new methods of teaching and learning [14].

This study will discuss how E-learning based teaching can be used to benefit HIMTA to conduct teaching courses by implementation of pilot project to develop database teaching course by using Moodle and then analysis of result of study [15].

And how this study helps to overcome potential limitations of teaching programmers in an alternative to face to face teaching [16]. The E-learning based teaching can be designed to support individual or organizational skills development. Examples include courses developed to provide information as well as those designed to build specific job-related skills [17], [18], [19]. A myriad of online learning solutions has emerged over recent years, including self-paced e-learning, virtual classrooms, simulations, games and communities of practices [20], [21].

1.1 Problem Statement

Libyan public and private organizations face a big challenge in business due to lack of competency among their staff, therefore there is a big demand for teaching to fill the gap between staff capability and job requirements [22], [23], [24].

HIMTA as higher education institute needs to address this challenge by providing wide range of teaching courses but there is a limitation in terms of teaching staff, resources, equipment's, and classrooms.

On other hand, Lack of examples for teaching is a disadvantage of traditional classroom as teaching has limited time, students have different capability in terms of understanding, and tutor can't manage demand of big students' number in the class

1.2 Related Work

Pucel and Stertz have conducted research study comparing eLearning methods versus traditional classrooms regarding the perception of the quality of education and performance improvements by students in specialized teaching programs for professionals specializing in vocational training.

The overall objective of this research project was to develop an eLearning framework, and determine whether it yielded similar outcomes as the traditional classroom, [25], [26] by using the same assessments, educational goals, and means of evaluation in each medium. The evaluation showed that the students considered both classes to be equally difficult and engaging. There wasn't any important variation found concerning the students' assessment attained through the use of these teaching techniques, though they showed slightly more favor

to the conventional learning approaches. In terms of performance in many different subjects, unequal results have been noted between people who use online resources and those who learn conventionally, in the context of Career and Technical Studies: History and Philosophy [1], [27]. In three of the four overall criteria, online students outperformed their peers attending traditional classes. They also showed significant superiority in the final exam. However, for presentation material in this class module, learners in conventional formats outperformed their counterparts using eLearning formats [28]. It was revealed in studies that participants of both an entirely online program and those who utilized blended approaches exhibited significantly greater academic performance than their counterparts who learned solely through traditional classroom. Learners in the virtual classroom expressed a much higher satisfaction with their overall educational experience than their traditionally enrolled peers.

These findings suggest that a well-designed online course can be very effective in teaching wellness. Also, online learning may motivate students to become more active learners, making them responsible for more of the learning process because it accommodates different learning styles and is convenient for students [2], [29]. Dougiamas, Taylor. The study aimed to analysis the effect of teaching any online course (by using Moodle) on student interaction. The researchers had chosen construction course for 8 postgraduate students by using Moodle as presented in Figure 1 below at Curtin University of Australia. The result of questionnaire indicated that the course had achieved the aims of study successfully [30].

1.3 Research Question and Hypotheses:

Research Question

What is the difference between the Database course scores of the students who received traditional classroom (whiteboard and lecture instruction) and the students who received Moodle based teaching (E-learning)?

Research Null Hypotheses

H1: There will not be a statistically significant difference between the Database Scores of the students who received whiteboard and lecture instruction and the students who received Moodle based teaching (E-learning).

1.4 Study objectives:

This study has following objectives:

- To design and implement a proposed Database course for students based on needs of potential students using modern technology.
- To evaluate the influence of the proposed course on students. achievement in comparison with traditional classroom delivery.

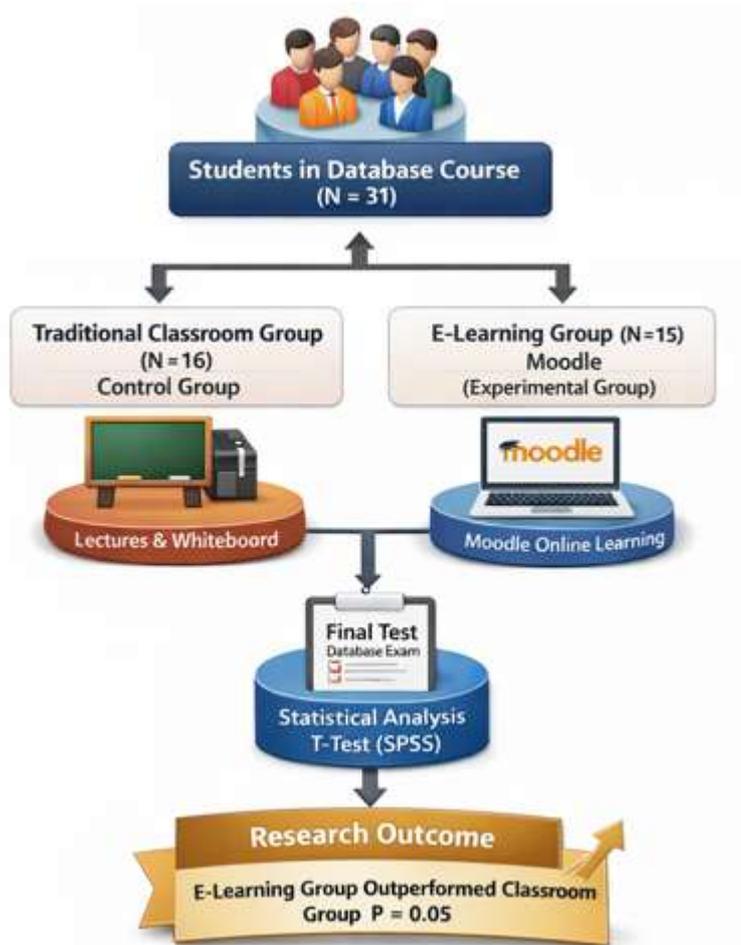


Figure 1 The experimental design of this research study

2.0 Literature Review

2.1 E-Learning:

The E-learning has different definitions, one of these definitions stating that E-learning is the set of "whole activities of teaching and learning based on computer management environments constructed from network information techniques with interactive communications"[4], [31]. Probably the best definition is stating that E-learning is "any learning, training or education that is facilitated by the use of well-known and proven computer technologies, specifically networks based on Internet technology"[5], [32]. This definition includes the key ingredients for the growing success of E-learning in the last couple of years: the advances in network and communication technologies.

There are four main phases in the E-learning process ranging from defining the targets and requirements (design), through generating and packaging learning materials (production) and distributing it (deployment), to the final assessment of learners and the process itself [6], [33].

2.2 Technological Forms of E-Learning:

The development of electronic education can be divided into several periods according to techniques of communication and methods of sharing information contents.

A. Computer Based Training (CBT)

The definition of the term lies in its title. Electronic education is realized by using a computer, e. g. by CD-ROMs with an appropriate program. According to Kopecký, the main

development of CBT in educational institutes can be dated between years 1990 and 1999. However, [7], [34], CBT cannot be regarded only as a way of supporting school education; the principle is used for numerous games and simulations. For example, Czech Airlines are using CBT for an individual pilot training [8], [35].

B. Web Based Training (WBT)

Not only did the system settle the issue of updating but it has also brought new ways of communication between participants. WBT represents electronic education supported by a web, which means immediate updating whenever needed using the Internet or the Intranet [36].

It might seem that this system has no drawbacks, however, there is one major disadvantage of WBT. "WBT as well as CBT is not standardized. There are no obliged rules for structure of education courses, for distant text building and so on. Since WBT made access possible for many classes of population, requirements for administration of the courses started to grow".

C. Course Management System (CMS)

To create a course on the Internet requires rather extensive knowledge of HTML or other programming language, which is, however, not true for CMS. This system facilitates building a course with basic knowledge of any of the computer language. "It provides an instructor with a set of tools and a framework that allows the relatively easy creation of online course content and the subsequently teaching and management of that course including various interactions with students taking the course"[9], [37], [38].

2.3 E-Learning implementation challenges:

Despite huge potentials that E-learning technologies have in enriching education delivery in developed countries, the application of such technologies in the context of developing countries is limited [10], [39].

E-learning technologies are not yet used pedagogically by most instructors. According to instructors and students usually use programs such as word processing, spread sheets and graphics for preparation of examinations and other related academic works [11].

There are different challenges that make instructors and students in most developing countries unable to fully exploit E-learning technologies. Some of the challenges are inadequate infrastructures such as computer and internet.

Another challenge is lack of readily access to E-learning technologies by both instructors and students in most developing countries. The situation regarding access to different technologies is different for different stakeholders [12], [40]. For example, in a study more than 60% of students in their study reported to have no access to video, computer and internet and only about 4% of the students had access to computers at home and 1% of students had access to internet at home. Also literature shows that students access E-learning technologies at different places such as home, workplace, university, or other places [13], [41].

Successful implementation of E-learning technology requires a thorough understanding of the context. As mentioned earlier, this study is carried to understand the context of the Libyan higher education, and how to use open source software (MOODLE) to develop database course.

3.0 Types of LMSs

Choosing the right Learning Management Systems (LMSs) mostly depends on several factors that an organization considers important. Organizations have the freedom to choose the system that best fits their strategic goals, educational needs, and, importantly, their budget [14].

3.1 Open Source Learning Management Systems:

An open source software (OSS) is software that has its source code available for anyone to see and use without paying anything. Like other open source apps, an open source LMS can be used and changed to fit what the user needs. Usually, these systems are released under the GNU General Public License [15], which gives the copyright holder the right to share and distribute the software with others. The development process usually involves a group effort, where developers in the community work together to add and improve features while they interact with the system. The technological framework is usually built using freely available tools like programming languages, databases, and web servers

3.2 Commercial Learning Management Systems:

Proprietary LMSs are made specifically for business use and are usually created by commercial vendors. The financial implications have turned out to be a major challenge with these systems. Renewing site licenses every year costs a lot, and it gets more complicated when different institutions have all kinds of specific needs [16]. The main issue is that these systems can't be easily changed to fit the unique needs of the institution because the vendors hold the copyrights [17]

.A lot of systems in this category actually started as projects at universities, not from companies that make business software. Even though open source platforms like Moodle dominate the E-learning sector right now [42], there's still some room for commercial systems. Blackboard and Desire2Learn are examples of proprietary LMSs.

4.0. MOODLE

The previous section gave a clear look at LMSs and how important they are in teaching. Moodle has become the most commonly used and popular LMS in schools and colleges these days [18]. This study focuses on Moodle because it's one of the main systems many schools use to support their teaching and learning. This means we need to take a close look at the system to understand its main features and how it works, which helps set the stage for this section.

4.1. History and Underlying Philosophy

MOODLE, which stands for Modular Object Oriented Dynamic Learning Environment [19].it is an open source software(OSS) that supports the creation and management of online learning platforms. This software plays a key role in the establishment of online courses and helps augment blended learning [43], which combines traditional face-to-face instruction with digital learning modalities. MOODLE is distributed under the GNU General Public License, which allows users to redistribute and modify it according to the terms of this license.

The system was first created by Martin Dougiamas, who began developing it in 1998.The first version of the system is called Version 1.0 was made publicly available in August 2002.Presently, Moodle Pty Ltd administers Moodle, and the latest version is Moodle 2.8.

The Moodle community has grown steadily and currently includes about 51,732 registered sites, there are 7.5 million courses available, and the number has reached 70.7 million users are spread across more than 224 countries [20]. These users include a diverse group such as educators, learners, software developers, researchers, and administrative personnel in educational and system areas. The system has been made accessible in roughly 82 languages through extensive translation efforts [44]. The key characteristics of Moodle include flexibility, compatibility, and user-friendliness, and it can also operate as a standalone system.

4.2. Architecture and Technical Platform:

Moodle is built on the LAMP platform; which includes Linux as the operating system, Apache as the web server, MySQL as the database management system, and PHP as the

programming language. Installing Moodle is simple and only requires basic needs like a web server that supports PHP, databases from MySQL [45], [46], Oracle, or PostgreSQL, and enough file storage (Table 1). The installation requirements include access to the internet and a web browser that typically supports a WYSIWYG (What You See Is What You Get) HTML editor.

Table 1: Moodle technical platform

Moodle Core, Add-Ans , Plugins		
Apache Web Server	Data Base (My SQL, PostgreSQL)	PHP Programming Language
Operating System (Linux Windows and others),		

4.3 General APIs:

API (Application Programming Interface) is an interface or protocol that allows two or more software applications to interact and communicate with each other. Within the context of Moodle and its architectural framework, APIs are critically significant because they ensure the efficient integration of standard plugins and provide essential tools for the execution of Moodle scripts[21]. Among the most widely 25 used Moodle APIs are the Access API, Data Manipulation API, Navigation API, and Upgrade API.

4.4 General Plugins:

Due to its inherently extensible architecture, Moodle is augmented by a variety of plugins that enhance the core functionalities of the system, including libraries and databases. A plugin is an application that adds additional capabilities to the primary application [22]. In the Moodle ecosystem, a plugin can be classified as either standard, meaning it comes bundled with the core package, or as an add-on, which is created by a community of software developers. Common categories of Moodle plugins include activities, blocks, themes, user management, plagiarism detection, repositories, and filters [23], [47], [48].

4.5 Features of Moodle

Features of the Moodle system are developing practically every second but there are main features which this study is try to adopt in database course. Since the study is not a manual for creating an online course, the focus will not be put on how to create a course but rather to compare between two modes of delivery and how E-learning helps students with their learning process as presented in Figure 2 below [49], [50].

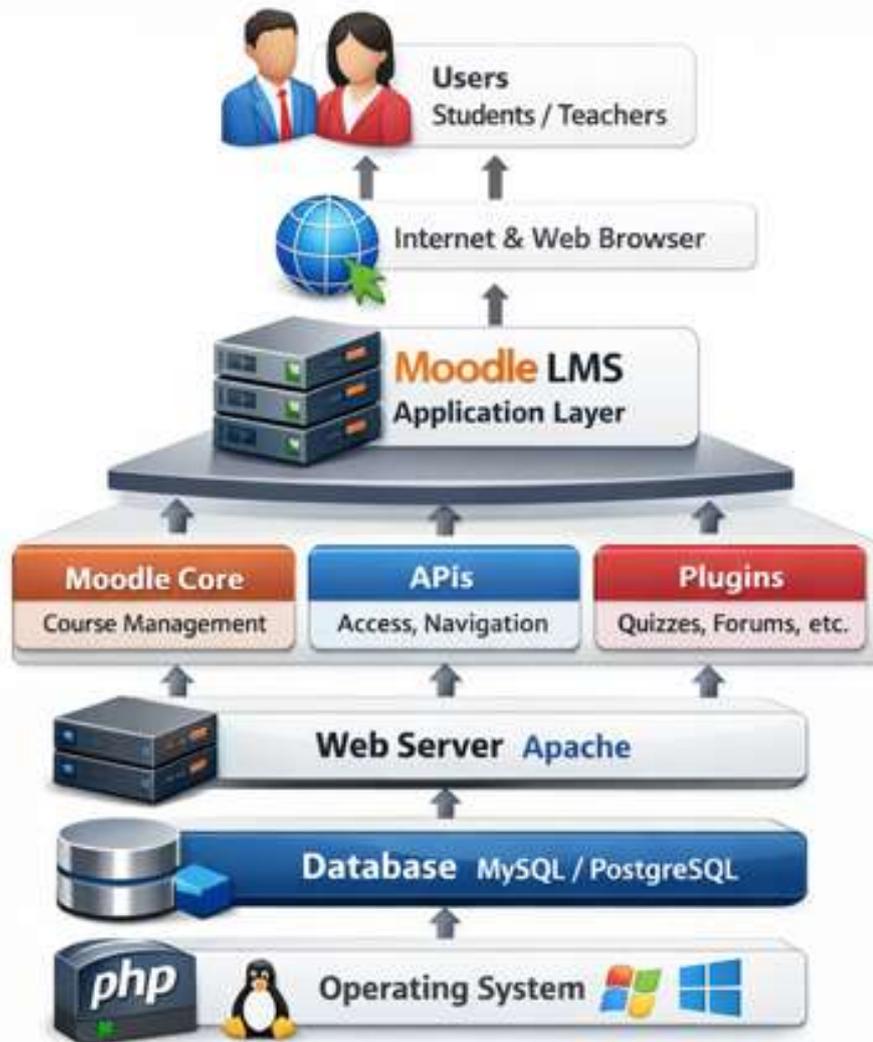


Figure 2 Moodle E-learning system Architecture

5.0 Design and Implementation of Project:

Lessons can be organized into several generic structures, such as a linear sequence, a branching hierarchy, or a two-dimensional grid. Although these generic structures have their place, most E-learning is structured in ways that reflect the needs of learners and the nature of the subject matter. We call these organizations “purpose-specific” and design them around the subject matter and the learners’ need for knowledge.

Here, this research have used the topic architecture, which fit with purpose of design and develop of database course, where learners start with an introduction to the lesson and then proceed through a series of topics teaching progressively more advanced skills or concepts. At the end of the sequence, learners encounter a summary or review of the concepts and a test or other activity to measure whether they accomplished the objectives of the lesson as presented in Figure 3 below.

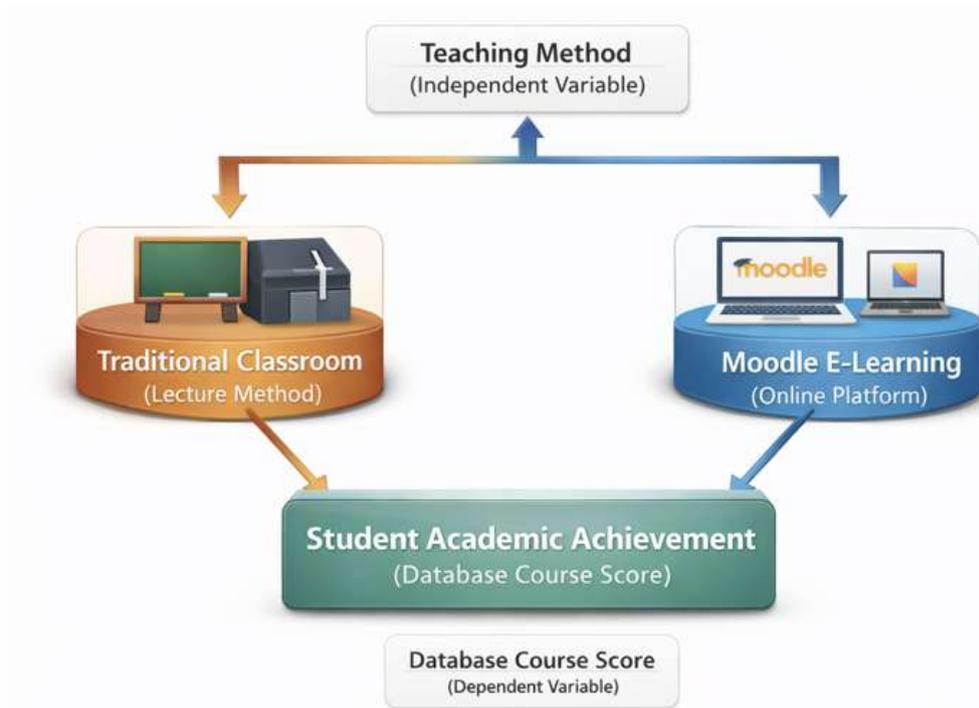


Figure 3 The Conceptual Framework

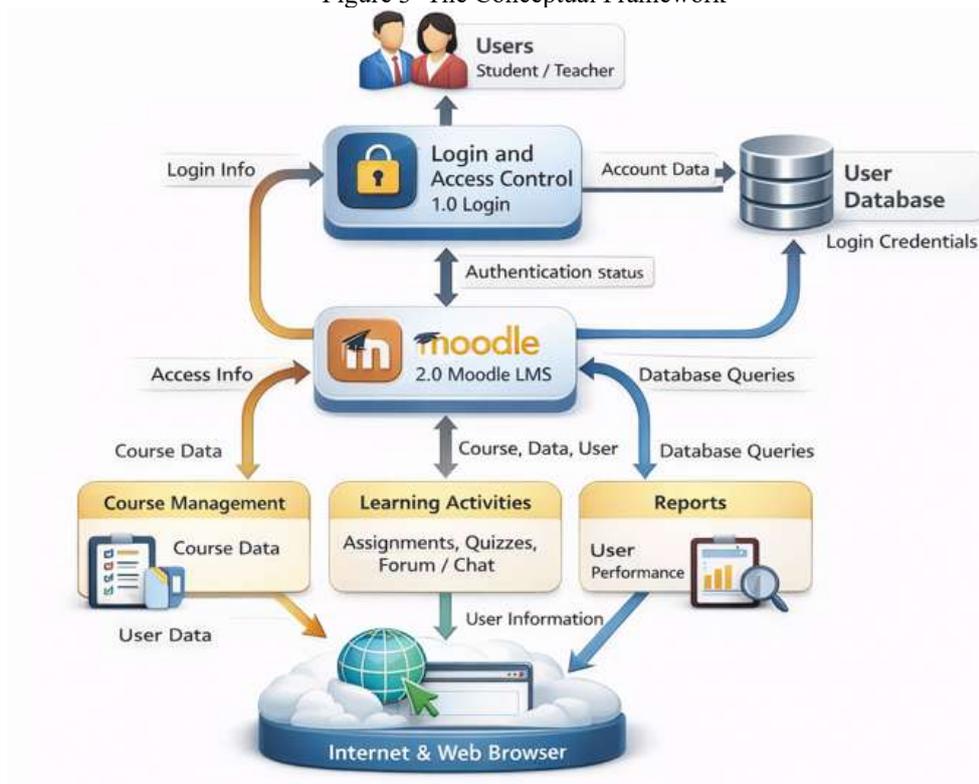


Figure 3 the system DFD diagram

Course Log in:

The URL of course is: <https://libyatraning.gnomio.com/course/view.php?id=2>

To login to the course you have to enter username and password.

As course admin you can add users to course (students, instructors) and give each of them permission for instance instructor can amend course material but this permission is disabled for students.

6.0 Result and Discussion

6.1. Introduction:

The purpose of the research study was to discover if using E-learning (Moodle) to deliver Database online course improves student achievement. The study was of two groups of students (classroom based and E-learning based teaching), both groups had same course material and subjected to pre-test and post-test.

The study took place in HIMTA which is located in Tripoli. The participants were students of different back ground, for classroom group the sample was 16 candidates and E-learning group was 15(2 were excluded).

The independent T.test was an appropriate statistical measurement to employ when comparing the means of traditional classroom and E-learning groups. The independent T.test was utilized to test the hypotheses. Variables were the difference in the mean scores of both. The classroom group received the whiteboard/lecture method of learning, and the E-learning group received online learning. An independent T-test was utilized to determine if a statistically significant difference existed between the mean students' score of both groups [49], [50].

6.2 Instrumentation

Two different teaching methods were the independent variables in this research study. One method was the classroom and lecture method of teaching, and the other method was the E-learning method of teaching including online videos, online testing, blogs, chatting rooms, forum, quizzes, video conferencing etc. SPSS (Statistical Package for the Social Sciences) statistical software was the measurement tool. The SPSS software program is one of the most widely used statistical analysis programs used for educational research. The SPSS software program was an efficient and concise tool to measure the variables in the study.

6.3 Results

This study has been determined that the independent T.test should be the method of data analysis for this study. The independent T.test should be students when comparing two means and when the treatments have been randomly assigned. If the sample size is less than 30 as presented in Figure. 4 , For this study, the researchers utilized the SPSS software to analyses the student data employing the independent T.test to test the hypotheses. The SPSS program identified the M (arithmetic mean), the SD (standard deviation), the T (T.test) , the P (P value), the mean difference, and the CI (confidence interval) for the collected data. For the study, the dependent variable was database students scores. The independent variable was teaching methodologies. The classroom group received the whiteboard/lecture method of database course, and the E-learning group received Moodle methods of database course.

An independent was employed to determine if a statistically significant difference exists between the classroom group's mean database score and the E-learning group's mean database score when technological instruction was employed and when whiteboard and lecture was the method of instruction, the M (arithmetic mean) for classroom group was 63.71 and 76 for E-learning group(Table 1).

The independent T.test identified $T = -2.259$ and $P = 0.0341$ at a 95% confidence interval, and the $P = 0.0341$ was lower than any standard significance level, and in particular the alpha level of 0.05 used with SPSS. Furthermore, $P = 0.0341$ means that one shouldn't expect to achieve a result with similar differences approximately 94% of the time. Based on the data in (Table 2), the researchers did not accept the null hypothesis H_1 which stated: there will not be a statistically significant difference between the classroom group database scores and E-learning group database scores. In conclusion, there is not enough evidence to say there is a statistically significant difference between the mean scores for classroom and E-learning

groups in database course in favor of E-learning group which means that using of E-learning helps students to achieve rather than classroom based .

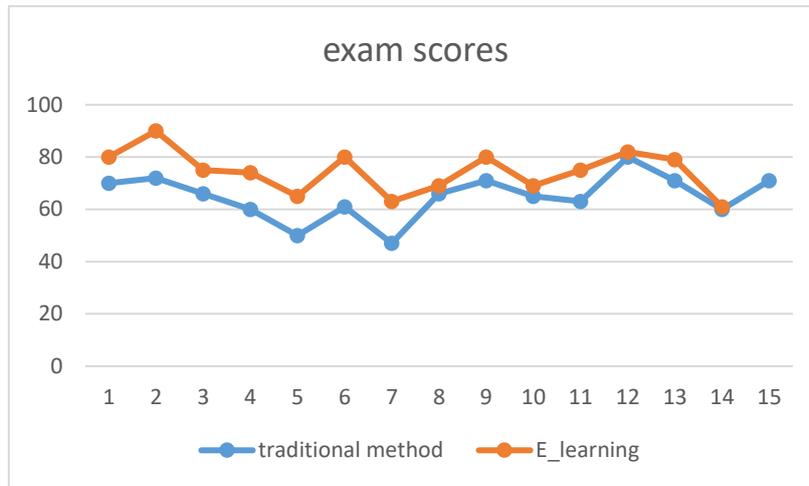


Figure 4 The Score of students in both Method

Table (2) The T.test Result

Group	N	M	SD	T.test	P
The traditional method	16	63.71	17.02	2.259	0.0341
E-learning	15	76.00	10.74	2.259	

7.0 CONCLUSION

The purpose of this study was to investigate the effects of using Moodle based teaching on student’s achievement in comparison with traditional classroom used in database course at HIMTA (in Libya).

The T.test revealed that there were statistically significant differences in student achievement among the two learning groups. The results of this study indicated that students in the Moodle based learning group had a statistically significant higher achievement than students in the traditional classroom learning group.

However, to maximize the different benefits of Moodle to be implemented on different teaching courses, further research needs to be conducted taking another group of participants: larger in size, mixed in gender and at different study level and courses.

The findings of this study indicate that the implementation of online teaching by using Moodle will help higher education to overcome potential teaching issue such as lack of resources, facility and instructors.

For decision maker this study will raise awareness of importance of implanting E-learning methodology in education sectors, and recommending the education organization to apply the system to take advantage of the positive impact of the use of the Moodle system in the development of self-learning skills.

المستخلص

على الرغم من انتشار التعليم الإلكتروني في مجال التدريب والتعليم في جميع أنحاء العالم، لا يتم تطبيق هذه المنهجية على السياق الليبي، لذلك رأينا هناك حاجة لدراسة تأثير نشر منهجية التعليم الإلكتروني في مجال التدريب. والهدف الرئيسي من هذه الدراسة هو تطوير تدريب التعلم الإلكتروني باستخدام برنامج مودل مفتوح المصدر (نظام إدارة التعلم)، والهدف الثانوي هو لمقارنة آثار وضعين مختلفين من التعلم (التعلم الإلكتروني، و الفصول الدراسية التقليدية) على

تحصيل الطلبة في المعهد العالي للعلوم والتقنيات الطبية ابوسليم. وقد تم إعداد هذه الدراسة لاختبار درجات الطلبة في مادة قواعد البيانات من خلال مقارنة نتائج الاختبار وكانت العينة (16 طالبا في وضع الفصول الدراسية و15 طالبا في التعلم الإلكتروني).

أظهرت النتائج النهائية ان متوسط الفرق باستخدام اختبار (ت) للمجموعتين أن مجموعة التعليم الإلكتروني تحصلوا على انجاز أعلى ذات دلالة إحصائية من مجموعة التعليم التقليدي بمستوى الدلالة ($P < 0.05$). كما أشارت هذه النتيجة الى أن تقدم الطلبة في كلتا الحالتين كان ملحوظا.

وتشير هذه النتائج إلى أن التفوق باستخدام التعلم الإلكتروني مصممة تصميميا جيدا يمكن أن تكون فعالة جدا على نجاح الطلبة.

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