

# IMPACTS OF THE EFFECTIVE TEACHING USING COMPUTER APPLICATIONS IN LABORATORIES: CASE STUDY FOR INTRODUCTION TO DATABASE SYSTEMS COURSE

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**ABSTRACT**— Faculty teachers' choice a different teaching method that is suitable to his/her courses. This choice depends on his/her educational philosophy, classroom demographics, subject area(s) and college mission statement. Effective teaching is intellectually challenging in that it requires the teacher to recognize, in a deep sense, the course being taught, know how the students in this class learn, and how to teach them. Research on the effects of using computer applications in laboratories to teach the computing courses is diverse. This study aims to add the literature by analyzing the motivational effects of using computer applications in laboratories as a basic tool from the first day of class to teach an introductory course for the fundamentals of databases system. During run the course, both self-improvement and self-assessment for the course regularly enrich the effective learning and promoting the teaching methods for the students. The results show that using laboratories instead of classrooms positively affects students' sense of learning for the computing courses especially when done in a community. Moreover, the participation rate of the class increases by 25 percentages on average. The final grading indicates that new environment impacted positively the students' marks.

**Keywords**—effective teaching; teaching methods; Database systems; computer applications; Lab-Based Learning.

## I. INTRODUCTION

Computing science for both computer and information courses play an important and one of the most exciting and self-motivated disciplines. However students often distinguish introductory computer-science courses; like as Introduction to Databases course (IS320), as difficult and dull, especially those students who are motivated mainly by intellectual curiosity [1]. The most important reason behind the failure to engage such students in the introductory computing science courses is a focus on computer systems instead of computing applications. This encourages us in our information systems department, CCIS, IMAM University to modify our learning methods from traditional ones that is based on the pure teaching at the classrooms only to the modern approaches that is mixing the theoretical parts at the classrooms and then practical training in the laboratories. Finally, to the most modern teaching methods based on completely to hybrid both of the theoretical parts and the practical parts simultaneously at the lab from the beginning of the course.

A teaching method is characterized by a set of principles, procedures or strategies to be implemented by teachers to achieve desired learning in students [2]. These principles and procedures are determined partly by the nature of the subject matter to be taught, and partly by our beliefs or theories about how students learn. The design and selection of teaching methods must take into account not only the nature of the subject matter but also how students learn [3]. Moreover, the learning environment and the available facilities that offered by the institutes have an excellent effect in the teaching.

Effective teaching is intellectually demanding in that it requires the teacher to know the course being taught. The personal characteristics of the teacher, like how he able to think and how he able to be a problem-solver and analysis the course topics, play a role in the effective learning the course. On the other hand, selecting suitable teaching strategies and environment for the taught course has a positive impact on students' knowledge and improve their results.

It is known that the educational process in all its aspects depends heavily on figures teaching positions. Effective teaching [4][5] occupies the keystone for achieving the goals of the educational process in order to achieve the basis of Intent Learning Outcomes (ILO) of the specified course and so the educational process outputs are positive. One of the most important effective learning techniques is using the computer application to help the learners to understand and practice the course. The effectiveness of the teaching process also depends on the learning environment and whether it is done in single mode or community mode. Calm environment plays a based role to decrease the noise of the students and the crowing of the teachers otherwise the effective teaching will not be achieved.

Our aim in this paper to show to what extent the computer application like as Oracle database application [6] can be an effective method of education and learning for the students that taught the introductory course of database systems (IS320) at level five in our college. We chose the Introduction to databases course because it is considered as a core course in all computing departments. We believed the same result can be achieved in similar courses. The strengths or weaknesses reflected in the educational process using such a computer application will be discussed.

The paper is organized as an introduction, three sections, and a conclusion. In the second section, we describe briefly the different teaching improvement stages. In the third section, we introduce our current case study. In the fourth section, the outcome results and their discussions will be demonstrated. Finally, we conclude our work in Section V.

## II. TEACHING IMPROVEMENT STAGES

Although the traditional lecture method in the normal classrooms has a few advantages that have kept it as the standard approach to teaching for very many years. Like as; exposure to the new material, greater teacher control in the classroom, engaging format, complement and clarify course material, and facilitates large-class communication [7]. The modern teaching techniques believed that the practical methods, especially in the existence of computer learning systems and computer applications, will attract the learners

and students on the college level and impact their performance learning. This is a way for students to interact with other students from their class, on a much more personal level that solves one of the disadvantages of lecture method named as a one-way teaching approach.

The practical part of the education stages for computing courses like the ones taught in computer and information colleges is the most luxurious part of the education. Therefore, it is most suitable to consider ways of making practical work more efficient and more effective in the teaching courses. The main goals of practical training for computing courses [8]:

- i. Training the students to have an observational skill that is relevant to the teaching courses.
- ii. Improving understanding of approaches of systematic examination.
- iii. Evolving problem-solving skills.
- iv. Encouragement of professional attitudes.

### III. CASE STUDY

We decided to choose our case study from the major computing subjects that are widely taught in the different departments of computer and information sciences colleges. We chose the Introduction to Databases course (IS320) that is offered by our department, information systems department, college of computer and information science at Imam Mohammed Ibn Saud Islamic University. This course considers as a core course in our Information system plan. Meanwhile, this course is offered to different other departments in our college.

In the following subsections we will describe and evaluate our experiences and improvement stages for teaching our case study course –IS320– that was offered by our department for six consecutive academic years, starting from the academic year 2012-2013 (two terms Fall and Spring in each academic year - twelve terms in total) in three different learning environments.

#### A. Case Study Course (IS320 – Introduction to Database Systems)

This course introduced the main concepts to database development, including data analysis, design, modeling, and Structure Query Language (SQL). Students explored the basic concepts and features of a database management system (DBMS) and how to design the conceptual phase for specified informal system description, with stress on relational database model, and practical exercises for using Oracle database 12g [6] to implement a real phase. Our source textbook was written by Ramez Elmasri and Shamkant B. Navathe [9]. The class taught three times per week each one is one hour (the course is three credit hours-45 hours per term). Nine chapters were covered in details. In general, there are about 4 to 5 sections (both male and female) per term; each section has about 20-30 students (i.e. the average number for participation in each term about 115 students). Two or three college staffs teaching each term (the first author is one of teaching team usually in the period of this study).

#### B. Improvement Stages

The improvement stages for teaching this course is divided into three modes:

1. **Traditional Classrooms Teaching Mode:** in this type of teaching, the course teachers gave the lectures fully in classrooms without using real training in the laboratory. This mode happened during the first period of our study period the academic years 2012/2013 and 2013/2014.

2. **Mix-Traditional and Practical training Mode:** in this mode, we decided to improve the course by given training for the student in laboratories for 7 credit hours following 36 credit hours in traditional teaching in the classrooms. Mainly, these training concentrates to show the applicability of SQL language only. This type happened during the second period of the study period the academic years 2014/2015 and 2015/2016.

3. **Full Practical Laboratories Mode:** in this mode, the department decided to teach the course for the students fully in laboratories environment from the first day of class. The intention is to make a connection between the theoretical elements of a discipline course and the practical aspects of technical performance. This done simultaneously by hybrid the theoretical parts with training using Oracle Database 12g. This happened during the third period of our study period the academic years 2016-2017 and 2017/2018 (and still on during the current academic year).

#### C. Evaluation Criteria

In order to evaluate our teaching improvement in different three teaching stages that mentioned previously. We use four basic sources of information that can be used to evaluate the impact of teaching [6]:

- (1) Self-monitoring,
- (2) Student's information,
- (3) Students test results,
- (4) Participation rate, and
- (5) Outside Observer.

Each one of these evaluation efforts has a unique value as well as an inherent limitation. The values of this evaluation –See Table 1–collected through either the direct contact with the responsible or from collecting information from questionnaires and interviews. For example, the self-monitoring values collected directly from course staff members, the student's information values got from the students during office hours and the assessment evaluation questionnaires that done by the student affairs section at the end of each course. While the student's test results and participation rate values got from the banner system. The outside observer is collected through the interview directly with him. In our study, our outside observer was the department head.

### IV. RESULTS AND DISCUSSION

The laboratories practice gives students more close awareness of the subject discipline and more intense participation in the processes of real learning. Laboratories work also encourages cooperation and teamwork among students, thus reinforcing the community aspect of learning. Together, all of these elements can give to a positive and exciting learning environment. The impact of the student towards the course is increased and their perception too. From teachers viewpoint; their impact and perception is gain highly. The department manager got very less complain about the course..

**Table 1. Improvement Evaluation Results**

	Self-monitoring	Student's information	Students test results (on average)	Participation rate (on average)	Outside observer (head manager)
<b>Traditional Classrooms Teaching Mode</b>	neutral	disagree	Succeed: 62% Fail: 30% Denied Entry: 8%	65%	disagree
<b>Mix-Traditional and Practical training Mode</b>	agree	agree	Succeed: 71% Fail: 21% Denied Entry: 8%	72%	agree
<b>Full Practical Laboratories Mode</b>	strongly agree	strongly agree	Succeed: 84% Fail: 12% Denied Entry: 4%	85%	strongly agree

Although, it is realized that many factors are responsible for student succeeds and grads to achieve in college [10] and hence that a change to any single factor may have a relatively limited effect on student learning and achievement. The learning techniques described in this paper noticeably improving achievement for all students, and perhaps obviously, they will benefit only students who are motivated and capable of using them. Nevertheless, when used properly, we suspect that they will produce meaningful gains in performance in the learning goals.

**V. CONCLUSION AND FUTURE WORKS**

This work outlined some significant successes over recent years about the improvement of teaching strategies for one of the core subjects for computing students in the college's level that is an introduction to databases. Department management head himself felt that we have developed some sensible strategies to enhance the experience for teaching such course to department students and those college staff involved in the provision of the courses. Furthermore, the students themselves report positively on their learning experience in the course and therefore rate the course very favorably

Moreover, the college teachers have less complain of the students for understanding the theoretical concepts and about their lower marks. The participation rate of the class increases by 25 percentages in average. The final grading indicates that new environment impacted positively the students' marks too. As future work, we hope to see the impact of applying the same approach for different similar computing courses; Like as, Web programming (IS203), Advance Database Management Systems (IS371), Geographic Information Systems (IS396), and Systems Analysis and Design (IS309).

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