Assessing Basic Computer Applications' Skills of College-Level Students in Saudi Arabia

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Abstract—This paper is a report on the findings of a study conducted at the Institute of Public Administration (IPA) in Saudi Arabia. The paper applied both qualitative and quantitative approaches to assess the levels of basic computer applications' skills among students enrolled in the preparatory programs of the institution. Qualitative data have been collected from semi-structured interviews with the instructors who have previously been assigned to teach Introduction to information technology courses. Quantitative data were collected by executing a self-report questionnaire and a written statistical test. Three hundred eighty enrolled students responded to the questionnaire and one hundred forty two accomplished the statistical test. The results indicate the lack of necessary skills to deal with computer applications among most of the students who are enrolled in the IPA's preparatory programs.

Keywords—Assessment, Computer Applications, Computer Literacy, Institute of Public Administration, Saudi Arabia.

I. INTRODUCTION

WITH the advancement of information technology, multiplicity and evolution of its means, and the proliferation of its uses; attaining acceptable computer literacy levels has become a necessity. Nowadays, most tasks that relate to our jobs or even our social life require some level of interaction and expertise with IT [1]. The transformation of governments to e-services, the adoption of online banking in banking industries, the use of electronic medical records in health care, and the reliance on automated production lines in manufacturing industries represent only few of larger set of examples that provide evidences on how Information technologies is intricately woven into to all aspects of our lives.

Education and training institutions continue to cope with these changes through relentless pursuit to develop the curriculum of their programs to ensure that they equip their students with necessary skills to deal with the modern means of information technology. In Saudi Arabia, for instance, most universities and higher training institutions' programs contain computer literacy courses. The main goal of these courses is to familiarize incoming college freshmen with basic computer applications' skills, and to enable them to work on Windows operating system environment and acquire the basics of Microsoft Office (MS) applications such as MS Word, MS Excel, Outlook, and PowerPoint.

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While these skills continue as a necessity for graduates to compete and secure future employment [2], the value of including a required computer literacy course in undergraduate programs is now becoming doubtful in Saudi Arabia. Today, many enrolled students feel that the course is not necessary since they have previously passed computer courses in their middle and high schools (7th – 12th grade). Additionally, some professors, instructors, and administrators have begun to have a perception that students are becoming more computer literate. Therefore, universities and training institutions must make a determination as to the accuracy of these perceptions in order to decide whether to keep, improve, or eliminate the required computer literacy course. This study aims to provide foundations for making informed decisions with respect to computer literacy teaching in higher education by providing answers to the following research questions:

1) To what extent do the faculty members who taught computer literacy courses believe that the entry-level students are becoming computer literate in Saudi Arabia?
2) What is the perception of enrolled students in college level programs regarding their familiarity with basic computer applications' skills?
3) How enrolled students in college level programs actually perform on a computer assessment prior to taking the required college computer literacy course?
4) How academic institutions can reshape computer literacy teaching in ways that would improve the competitive capabilities of the graduates in the job market with guarantee of increase in the level of effectiveness in terms of directing available resources towards the best use?

II. BACKGROUND

This study aims at the assessment of basic computer applications' skills for students enrolled in the Institute of Public Administration (IPA). IPA is a governmental training organization in Saudi Arabia that aims to contribute to the administrative development by promoting the efficiency of government employees, reinforcing efforts of administrative reform, providing administrative consultations and conducting administrative research [3]. One of the main tasks performed by the IPA is the development and implementation of preparatory programs that meet the needs of the labor market. Preparatory programs aim at qualifying Saudi citizens for specific employment in public and private sectors. The IPA offers two different levels of preparatory programs; the first is designed for high school graduates and aims to train them for required public and private jobs, and the second is designed for college graduates of certain fields of specialization. High

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school graduates who complete these programs are awarded post-secondary-school diplomas while college graduates receive higher post-graduate diplomas as they complete one of the post-college programs.

Preparatory programs include specialized programs in several areas, such as administration, finance and economics, library, and computer programs, and so forth. More than 1200 students are accepted and enrolled in these programs each semester. Preparatory programs are offered at the main center of the IPA located in Riyadh, and at three of its branches: Eastern branch in Dammam; Western branch in Jeddah; and the Women branch in Riyadh. All preparatory programs' curricula require completion of a required computer literacy course. These courses have different names and assigned different number of credit and attendance hours although their objectives and contents are generally consistent. Additionally, Computer literacy courses are taught by instructors giving lectures to students in computer laboratory where all students have access to computers during the lectures.

Due to the growing perceptions among instructors and administrators that students are becoming more computer literate and as the delivery of these courses continue to consume resources such as labs and instructors' teaching hours, the standing committee for programs design and development at the IPA called for this study. The main goal of the study is to assess computer literacy among students enrolled in the preparatory programs by assessing their skills in basic computer applications. The findings of the study are assumed to provide the standing committee with the information needed to make a set of decisions concerning computer literacy teaching at the IPA [3].

III. LITERATURE REVIEW

Researchers within the area of computer science and information technology education have been discussing computer literacy for more than three decades. What is of a particular interest for this study is the ways in which the concept of 'computer literacy' is defined and the methods of assessment used. Generally, the pertinent literature lacks of a widely accepted definition for "computer literacy" [4]. The term is ill defined and often used without any definition [5]-[7]. Therefore, this section starts by exploring "computer literacy" in order to more clearly define and understand the computer skills assessed in this study.

Earlier definitions of "computer literacy" term came from computer science domain and focused on the main topics of the domain including programming and computer architecture [4]. For instance, the Cassel Computer Literacy Test, developed in 1984 for literacy using personal computers, had 120 multiple-choice questions designed to test students in six computer science topics: computer development, technical understanding, computer structure, information processing, information retrieval, and communication systems [8]. These definitions have become inapplicable to today's computer world as the use of computers has become pervasive and essential and crossed the boundaries of professional use to personal use where most people are using computers on a

daily basis to perform personal stuff such as playing games, downloading music and sending and receiving e-mails [4].

Later research starts to focus more on knowledge that relate to a set of computer applications in defining "computer literacy" term. Barrera declares that the concept of computer literacy has changed over the past two decades as researchers have started focusing more on information literacy rather than computer literacy [9]. The evolution of computer systems and the proliferation of its uses have redirected the attention of researchers toward information technology [10], [11]. Thus, most of the later definitions of computer literacy describe application software programs, usually word processing, spreadsheets, and presentation graphics. Other definitions specify the popular Microsoft programs including MS Word, MS Excel and PowerPoint [12], [13].

Given these distinct definitions for "computer literacy" term, Lahore indicates the need to use a more specific approach than that used in previous studies. Lahore states that, these specifics may need to include "a basic understanding of computer terminology, the ability to manipulate and manage the Windows® environment (including file management functions), use basic features of word processing, spreadsheet, presentation and database software, use e-mail, and have a basic knowledge" [4, p: 16]. Based on this and given the objectives of computer literacy courses offered by the IPA, this study aimed to assess the competencies of enrolled students in manipulating and managing Windows environment besides their competencies in four computer applications that include MS word, MS Excel, email, and the Internet Explorer.

Various approaches and methods have been applied to computer literacy. One of the most frequently used methods is self-reporting assessments [14]-[17]. Self-efficacy questionnaires address the degree of confidence one has in his/her ability to do something on the computer [18]. Self-reports may involve reporting one's opinions or feeling about something and it may also take the form of reporting one's behavior with items that require respondents to indicate how often they use excel, or if they can do specific tasks [18]. Many researchers have criticized this approach. They argue that respondents need to have competence in a skill area in order to be able to accurately assess his/her skills in that area [19]-[22]. Consequently, if a respondent has little or no knowledge in a specific area, he/she may lack the precise skills necessary to accurately assess him/herself in that area [22].

Therefore, most studies that applied self-reporting questionnaires for assessing computer literacy have applied this method in conjunction with another type of measure [18]. Most identified research in pertinent literature that relied on self-reporting have also applied a written test to measure explicit knowledge of skills believed to underlie computer literacy, usually in the form of multiple choice or true/false questions [16]-[18]. Similarly, this study will apply both approaches for assessing both the perception of enrolled students in college level programs regarding their familiarity with basic computer skills and their actual performance. Additionally, the extent to which enrolled students are

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becoming computer literate will be assessed based on instructor's perspectives to maximize the validity of the study.

IV. METHODOLOGY

There are three approaches followed in this study to assess computer literacy of enrolled students in the preparatory programs at the IPA. These instruments include interviews with instructors, self-report questionnaire, and a written statistical test. The obtained data were processed by means of a series of qualitative data analysis and statistical techniques including percentages, graphs, and arithmetic averages. Following paragraphs discuss data collection and design methods as they belong to each of the three approaches.

First, qualitative data have been collected from semi-structured interviews with five instructors who have previously been assigned to teach computer literacy courses at the IPA. The main goal of these interviews was to discuss the extent to which instructors believe the enrolled students are computer literate before taking any of the required computer literacy courses at the IPA. Three questions were directed to each participant:

1) What is your assessment of the level of enrolled students in terms of their familiarity with the basic computer skills?
2) What are the points of strength and weakness in terms of students' ability to deal with basic computer skills that relate to MS Windows, Word, Excel, Email, and the use of internet?
3) What might be the consequences of eliminating computer literacy courses from the curriculum of preparatory programs?

All five interviews were conducted in Arabic, the respondent's native language. After that, researchers sent the abovementioned questions to other ten instructors via e-mail and seven of them responded. Interview data were transcribed and analyzed along with the returned written responses.

Second, the self-report questionnaire utilized in this study was designed to capture students' perception of their computer skills in MS Windows and MS application prior to starting the introductory computer literacy course. The questionnaire consists of five parts; each part consists of five items to capture students' perceived degree of proficiency experience with MS Windows, Excel, Word, Outlook, and Internet Explorer. The students responded to each item by either choosing 'yes', 'no', or 'I need to learn more'. For instance, one of the items used to capture students' perceived degree of proficiency with MS Windows was "I can create new folder and rename it again". The questionnaire was designed and presented to students in their native language, Arabic. To ensure the validity of the tool, the researchers presented it to one of the specialist in Statistics Sciences at the IPA who gave some remarks that were taken into consideration to reach the final design of the questionnaire. Afterwards, an electronic version of the questionnaire was implemented and coordination with the director of English Center took place to reach students. Groups were determined accordingly to approach them with coordination with their ELS instructors

during their classes' schedules. Students were told that they have the rights to respond voluntarily and they can choose not to fill out the survey after demonstrating the purpose of the study. The sample for the study was students accepted by IPA in fall and spring semesters 2013. Three hundred eighty enrolled students responded to the questionnaire.

Third, due to the considerable diversion between the findings of the data collected by interviewing the instructors who have previously taught computer literacy courses and the findings of the questionnaire, a written statistical test was developed to measure actual skills of students in the five content areas of the introductory computer literacy course. The statistical test assessment tool assessed students' skill proficiency in MS Windows, Excel, Word, Outlook, and Internet Explorer. The test consists of five parts; each part consists of five multiple-choice questions. The same procedure for reaching students in executing the self-report questionnaire was followed here and the sample was the same. One hundred forty two enrolled students answered the test from the main center and women branch.

V. RESULTS

This section presents the findings of the research based on data obtained through each of the three instruments of the study: the interviews with instructors, the self-report questionnaire, and the written statistical test. Based on the analysis of the interviews' data and the written responses of the instructors who have previously assigned to teach computer literacy courses at the IPA, the data indicates lack of necessary skills to deal with computer applications among most of the students who are accepted in the preparatory programs. Table I presents some quotes that support this finding, demonstrates some points of strength and weakness, and shows the consequences of eliminating computer literacy courses from the curricula of preparatory programs.

Conversely, the analysis of data obtained through self-report questionnaire showed the overall availability of abilities related to basic computer applications at most of the students enrolled in the preparatory programs of the institution. Table II presents the characteristics of the 380 enrolled students responded to the questionnaire. Described below, points that demonstrates the most prominent findings of the questionnaire according to the five main areas it examined:

1) Using MS Windows: This area shows the average of students' skills of using MS Windows; the majority of students (72.2%) have high skills of using MS Windows while those who have no skills or are interested in learning how to use MS Windows are only 27.8%.
2) Using MS Word: This area shows the average of students' skills of using MS Word; the majority of students (75.6%) have high skills of using MS Word while those who have no skills or are interested in learning how to use MSWord are only 24.4%.
3) Using MS Excel: This area shows the average of students' skills of using MS Excel; the majority of students (50.2%) do not have high skills of using MS Excel while those who have skills to use MS Excel are only 49.8%.

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4) Using MS Outlook: This area shows the average of students' skills of using MS Outlook; the majority of students (78.2%) have high skills of using MS outlook while those who have no skills or are interested in learning how to use MS Outlook are only 21.8%.

5) Using Internet Explorer: This area shows the average of students' skills of using the Internet; results show that the majority of students (81%) have high skills of using Internet while those who have no skills or are interested in learning how to use Internet Explorer are only 19%.

TABLE I
SAMPLE QUOTES FROM INSTRUCTORS' INTERVIEWS

Question	Sample of Instructors' Responses
What is your assessment of the level of enrolled students in terms of their familiarity with the basic computer skills?	"Scores and abilities of students vary in terms of dealing with computer in general." "There exists noticeable weakness in the ability of students to use Microsoft Office." "Most of the students neither have knowledge of the components of the computer nor the role of each component." "Most of the students have no knowledge of the scientific terminology of computer skills and its components." "Noticeable knowledge of dealing with social media such as Twitter and Facebook, but this is not the case with computer applications as there is weakness in skills related to the applications that rely on mathematical information such as Excel."
What are the points of strength and weakness in terms of students' ability to deal with basic computer skills?	Strength points: "The majority have the ability to deal with the Internet, and Email." "As time goes, there is improvement in students' knowledge of computer skills through their use of laptops and smart phones but they still need to be trained on how to use computer applications." Weakness points: "Lack of ability to use applied programs of the computer such as Microsoft Office." "Lack of skills in information security and computer's physical and software components and their functionality." "English terminology in the interface of applications resembles an obstacle for most of the students." "Lack of enough desire or interest to learn new skill among some students." "Most of the students do not prefer to engage into the deep details of computer, and they do not prefer applications either."
What might be the consequences of eliminating computer literacy courses from the curriculum of preparatory programs?	"Permanent dispense of the subject may stand as an obstacle for students as well as the instructors in conveying a lot of information that require prior knowledge of office programs." "Dispensing the subject may have negative effect for students who have never dealt with computer." "The subject must retain with necessarily reducing it to be less than four hours per week."

TABLE II
CHARACTERISTICS OF THE STUDY SAMPLE PARTICIPATED IN THE SELF-REPORT QUESTIONNAIRE

Qualifications	High school	318	84%
	Bachelor degree	62	16%
Region	Central region	203	53%
	Western region	92	24%
	Eastern region	57	15%
	Northern Region	7	2%
	Southern Region	21	6%
ELS level	First	256	46%
	Second	33	33%
	Third	77	20%
	Fourth	5	1%

TABLE III
CHARACTERISTICS OF THE STUDY SAMPLE PARTICIPATED IN THE STATISTICAL TEST

Qualifications	High school	122	84%
	Bachelor degree	18	16%
Region	Central region	90	63%
	Western region	8	6%
	Eastern region	36	25%
	Northern Region	4	3%
	Southern Region	4	3%
ELS level	First	5	4%
	Second	91	64%
	Fourth	46	32%
Gender	Males	62	64%
	Females	80	36%
Received Computer training	Yes	38	27%
	No	104	73%

Due to the considerable diversion between the findings of the data collected by interviewing the instructors and the findings of the questionnaire, a written statistical test was developed to measure the actual skills of students. Table III depicts the characteristics of one hundred forty two enrolled students answered the test. The results of the test indicate the lack for skills related to main applications of the computer at most of the students enrolled in the preparatory programs of the institution. The average score of all students was 46.8%. The calculated average scores of each area are as the following: 61.4% in MS Windows; 44.7% in MS Word; 21.8% in MS Excel; 28.2% in MS Outlook; and 77.8% in Internet Explorer.

Additionally, based on the significant reliance on this methodology in this type of studies, researchers have processed the outcome data to show the findings in a detailed manner by the characteristics of the study population. The following four points below summarize the findings:

1) Results of the two-sample t-test show no statistically significant differences in the computer skills among the students in high school and university programs in Internet, Microsoft Word, and the Outlook at the level of significance (5%). However, there are statistically significant differences in Microsoft Windows and Microsoft Excel for the students in the university programs at the level of significance (5%) as shown in Table IV, i.e. the level of students in the university programs is better than that of students in high school programs.

2) No statistically significant difference has appeared in the computer skills among students in the Main Center (males) and the Ladies Branch (females) in the Internet, Microsoft Window, Outlook, and Microsoft Excel at the level of significance (5%). However, there are statistically

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significant differences in Microsoft Word for females at the level of significance (5%) as shown in Table V.

TABLE IV
ARITHMETIC AVERAGES OF THE GRADES OF STUDENTS IN THE AREAS OF COMPUTER ACCORDING TO THE LEVEL OF THE PROGRAM

Area	High school Prep. Prog.	Univ. prep. Prog.	Total	%	t-value	Level of sig.
Internet	3.1	3.4	3.1	77.8%	1.37-	0.172
Windows	2.4	3.1	2.5	61.4%	2.41-	0.017
Word	1.8	1.7	1.8	44.7%	0.34	0.733
Outlook	1.1	1.5	1.1	28.2%	1.70-	0.091
Excel	0.8	1.3	0.9	21.8%	2.29-	0.024
Total	9.1	10.9	9.4	46.8%	2.53-	0.012
Percentage	45.6%	45.7%	46.8			

TABLE V
ARITHMETIC AVERAGES OF THE GRADES OF STUDENTS IN THE AREAS OF COMPUTER ACCORDING TO GENDER

Area	Main Centre	Ladies Branch	Total	%	t-value	Level of sig.
Internet	3.2	3.0	3.1	77.8%	1.5	0.141
Windows	2.5	2.4	2.5	61.4%	0.2	0.839
Word	2.0	1.6	1.8	44.7%	2.7	0.007
Outlook	1.2	1.0	1.1	28.2%	1.3	0.186
Excel	0.8	0.9	0.9	21.8%	0.6-	0.555
Total	9.7	8.9	9.4	46.8%	1.7	0.099
%	48.6%	44.5%	46.8			

3) Results of the two-sample t-test show no statistically significant differences in the computer skills among the students who have previously attended computer training classes and those who have not in the Microsoft Word, and the E-mail at the level of significance (5%). However, there are statistically significant differences in the Internet, Microsoft Windows and Microsoft Excel for the students who have previously attended computer-training classes at the level of significance (5%) as shown in Table VI, i.e. the level of students who have previously received computer training is better than those who have not.

4) Through One-way analysis of variance, no statistically significant difference has appeared in the computer skills among students in level one, two, and four in the Internet, Microsoft Word, E-mail, and Microsoft Excel at the level of significance (5%). However, there are statistically significant differences in Microsoft Windows for the students in level four of English Language at the level of significance (5%) as shown in Table VII.

TABLE VI
ARITHMETIC AVERAGES OF THE GRADES OF STUDENTS IN THE AREAS OF COMPUTER BY ATTENDANCE OF COMPUTER TRAINING

Area	Attended training			%	t-value	Level of sig.
	Yes	No	Total			
Internet	3.5	3.0	3.1	77.8%	3.14	3.14
Windows	2.9	2.3	2.5	61.4%	2.63	2.63
Word	1.9	1.7	1.8	44.7%	1.08	1.08
Outlook	1.3	1.1	1.1	28.2%	1.36	1.36
Excel	1.3	0.7	0.9	21.8%	3.59	3.59
Total	10.9	8.8	9.4	46.8%	3.94	3.94
%	%54.3	%44.0	46.8			

TABLE VII
ARITHMETIC AVERAGES OF THE GRADES OF STUDENTS IN THE AREAS OF COMPUTER BY ENGLISH LANGUAGE LEVEL

Area	Level 1	Level 2	Level 4	Total	%	t-value	Level of sig.
Internet	2.7	3.1	3.2	3.1	77.8%	0.5	0.626
Win.	0.7	2.5	2.6	2.5	61.4%	4.0	0.020
Word	2.0	1.7	2.0	1.8	44.7%	1.4	0.248
Outlook	1.7	1.1	1.1	1.1	28.2%	0.5	0.592
Excel	0.0	0.8	1.0	0.9	21.8%	2.4	0.094
Total	7.0	9.2	9.8	9.4	46.8%	1.5	0.220
%	35.0 %	46.2 %	48.8 %	46.8			

VI. DISCUSSION

As indicated above, there is a considerable diversion between the findings of the data collected by interviewing the instructors who have previously taught computer literacy courses, which showed lack of necessary skills to deal with the basic computer applications, and the findings of the questionnaire, which showed the availability of the required skills with the most students enrolled in the preparatory programs of the institution, which exceeded 50% except for Microsoft Excel, which was below 50%. This might be for what has been addressed by most the studies being discussed in the literature review section that indicates the inapplicability of self-report questionnaires to assess certain skills when respondents lack prior knowledge about the skills being assessed [19]-[22]. Hence, emerged the essence of the findings of statistical test which is perceived by research team as the actual reflection of the students in the preparatory programs of the institution, came confirming the findings of the interviews conducted with the instructors.

Therefore, it can be concluded that most of the students enrolled in the preparatory programs do not have necessary skills that enable them to deal with basic applications such as Microsoft Word, Microsoft Excel, and E-mail; less than 50%, except for the Internet and Microsoft Windows where the percentage of success reached 77.8% and 61.4% respectively. In addition, the results of the statistical tests do not indicate any statistically significant difference in most of computer applications among four different categories (Qualifications, ELS level, Attended computer training, and Gender) with exception to those who have previously attended computer courses prior to their enrollment in the institution, who represent 27% of the total 142 participants of the test.

VII. CONCLUSIONS

The main goal of this study is to provide IPA and other higher education institution foundations for making informed decisions with respect to computer literacy teaching. While the results of two applied instruments indicate lack of necessary skills to deal with basic computer applications, results also show that enrolled students are at different levels of proficiency with respect to those applications. IPA and other universities continue delivering computer literacy courses by lecturers giving lectures to students in a computer labs environment. This approach is now becoming inappropriate

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based on these results, as the instructors have to teach students with no previous computer experience, as well as students who were already computer literate on different levels. In addition, this approach consumes academic institutions' resources such as labs and instructors' teaching hours. Thus, it is of interest to reshape computer literacy teaching by changing the manner in which computer literacy is taught. As most academic and training institutions in Saudi Arabia have adopted learning management systems in their learning environments, they have to adopt to these changes and decided to use an e-learning environment to teach computer literacy courses fully e-based. Many universities have adopted this approach in developed countries and it seems that academic institutions in Saudi will be more efficient if they imitate such practices.

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