

# Towards improved student placement and preparation methods on Information Technologies post-secondary education

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**Abstract**—In this article we present the results of a pilot programme for student placement on the university, comprised of a preparation course, the GCE Ordinary level test in Computing, which students perform afterwards as a placement test, and a post-course questionnaire. The aim of the research programme is to identify weaknesses in the student placement tests and set the road map for improved first-time entrant placement and preparation. The study shows that common placement tests are far from giving strong predictions and they should be complemented with other metrics, such as high school grades or social factors. Test outcomes show that placement test results per se do not yield enough data to predict student success. However, we discovered it as a quite helpful tool for revealing anomalies at the institutional and methodological level, such as very different outcomes among campuses of the same university, or remarkable difficulty to answer certain questions. In order to enhance student placement accuracy and preparation for university, these issues will need to be addressed in forthcoming research.

## I. INTRODUCTION

UNIVERSITIES use placements tests to assess the students' academic abilities. In theory, test results give enough information about alumna skills to place them in the right level and determine which classes are suitable for each student. However, studies seem to indicate that accurate student placement is problematic [1].

At King Abdulaziz University we have started research in this area by requiring a set of first-time entrants to enrol a pilot programme for students placement, including the CPIT100 preparation course, the GCE Ordinary level test in Computing, which students perform after the course as a placement test, and a post-course questionnaire. Placement tests are broadly used to determine the level at which each student should be placed. However, studies agree in the fact that such exams perform poorly at proper student level placement. Therefore, we have carried out a review of studies about placement tests reliability, which is show later in the article.

The objective is to review placement tests as an instrument to predict student performance and to assess the outcomes to identify issues that need to be addressed and set the basis for the development of improved placement mechanisms.

The following section shows statistical data about study subjects (students). Section III describes instruments that have been used for the experiment, namely the course, the test and the questionnaire. Section IV describes the procedure for placement and preparation, which is basically taking the course, then the test and eventually filling in the questionnaire. In Section V, statistical data are extracted from test and questionnaire outcomes for analysis. Finally Section VI concludes with discussion of achieved results, studies reviews, discussion and requirements for further research.

## II. SUBJECTS

A total number of 2685 students distributed among three campuses took the course, specifically 1083 from Alsulaimanyah campus, 992 from Alsharafiyah campus and 610 from Alsalamah campus. Students also came from different educational backgrounds; 1387 of them came from a scientific scope, 1283 from administrative scope and 15 were previous regular students.

Finally, students were divided in two categories for the questionnaire: regular and distance students.

## III. INSTRUMENTS

### A. GCE Ordinary Level in Computing

GCE Ordinary level in Computing is a qualification created by ©Pearson Education to encourage candidates to develop an understanding of computer systems, software, data and hardware and their implications for communications and people. It also aims to help students acquire necessary skills to apply computer-based solutions to problems. Candidates who successfully follow the syllabus will have a good practical understanding of computing and its applications. Namely, they will: develop an understanding of the main principles of using computers to solve problems; appreciate the range of applications of computers and the effects of their use; understand the organizations of computer systems, software, hardware and data and their implications; acquire the skill necessary to apply computer-based solutions to problems[2].

We considered that meeting the objectives of GCE Ordinary Level in Computing Test requires a skill level

suitable for students beginning post-secondary education. Therefore, we decided to use materials provided for the qualification as tools to prepare first-time entrants and also as a possible way to assess their knowledge and predict at which level should students be placed at, once the university courses start. This means not entirely leveraging GCE as at qualification itself, but as a placement test that would allow predicting students performance. Placement tests are discussed below.

### B. CPIT100 Preparatory Course

CPIT100 is the preparatory course developed by King Abdulaziz University to help the students to achieve the assessment objectives of GCE Ordinary Level in Computing.

The course aims to provide the students with advanced skills to operate and make use of a personal computer in different environments such as in academia, in business, and at home. It introduces the students to the main concepts and terminologies of information technology, and equipped them with the knowledge to administer one of widely/used operating systems. The course also aims to provide the students with the practical skills to utilize an office productivity package for different purposes. The course will prepare the students for new learning methodologies, namely distance learning and e/learning. The delivery of the course contents will be based on a hands/on approach.

Apart from preparing students from the GCE placement test, our purpose was to reinforce computing and information technology skills of first-time entrants to the university. For skilled students, the course was expected to refresh and stimulate their capabilities. Nevertheless, underprepared students were the key, since the course was specially intended to bring them to the adequate level for post-secondary education. We considered the course as a mixture of a qualification, placement and remedial course.

Remedial education is a kind of teaching that is bellow university level work. It is designed to bring unprepared students to the level expected of entrants to the university. This kind of education has received criticism due to the "double billing" problem, which for unprepared students means to spend more than the amount needed for students that perform successfully by just following regular courses [3].

Although remedial/preparatory education is a controversial issue because of its expenditures, supporting arguments present remedial education spending as an investment. The hypothesis made here is that, in the long term, educating underprepared entrants will decrease the likelihood of their future dependency on social programs and as students that eventually obtain the degree, they would potentially contribute to the state taxes in the future [4].

### C. Placement Tests

Universities use placements tests to assess the academic abilities of the students. In theory, the results of these tests give enough information about students to place them in the right level. However, studies seem to indicate that the

accurate student placement is problematic. Many students are misplaced in remedial courses or wrong levels where they should be not in.

Some studies indicate that any model that uses final course grade as the criterion for the validity of a placement rule would likely fail [5].

The nature and validation of placement tests is rarely discussed in the language testing literature, yet placement tests are probably one of the commonest forms of tests used within institutions which are not designed by individual teachers and which are used to make decisions across the institution rather than within individual classes[1].

The predictive power of placement exams is still quite good given how short they are. But overall the correlation between scores and later course outcomes is relatively weak, especially in light of the high stakes to which they are attached. Given that students ultimately succeed or fail in college-level courses for many reasons beyond just their performance on placement exams, it is questionable whether their use as the only determinant of placement can be justified on the basis of anything other than consistency and efficiency. Allowing more students directly into college-level coursework (but perhaps offering different sections of college-level courses, some of which might include supplementary instruction or extra tutoring), could increase the numbers of students who complete university-level coursework in the first semester, even if pass rates in those courses decline [6].

Summing up, testing student abilities needs to be complemented with other several indicators such as high school grades and good teaching standards. A more suitable metric seems to be the combination of placement tests with other metrics such as high school grades, social factors, years since graduation in high schools, etc.[7],[8].

### D. Questionnaire

At the end of the course, students were asked to fill in a questionnaire were they were asked a series of questions about their daily use of new technologies and their level of satisfaction with the course to evaluate teaching quality. Since course experience questionnaires have proven to be a useful tool to evaluate teaching performance [9], we included it to help us improve future courses and also to get an indicator of the access students have to new technologies, which would give as an idea of whether they need more equipment at the campuses or they can carry out some work at home.

## IV. PROCEDURE

Before the academic course started, CPIT100 course was imparted to first-time entrants as preparation teaching for the GCE Ordinary Level in computing test. Individuals taking the course were classified by campus (Alsulamaniyah, Alsharafiyah and Alsalamah), by educational background (scientific, administrative or regular previous students) and by delivery mode (distance/external and regular students).

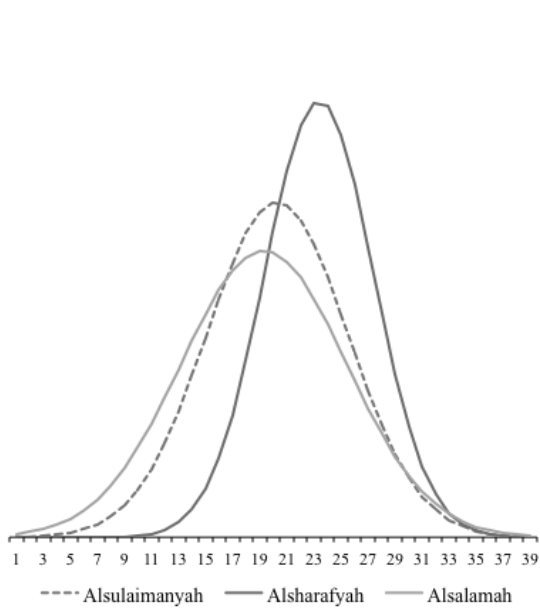


Fig 1 Average score by campus

After test administration, results were collected and analysed with Qualtrics research software [10]. We monitored mean score and number of correct answers by campus to assess how they perform individually.

Eventually, the post-course questionnaire was delivered to students to collect information about their personal opinion and their access to new technologies.

V. RESULTS

Test outcomes data are categorized into three campuses, Alsulaimanyah, Alsharafyah and Alsalamah. Fig 1 shows the normal distribution of scores by campus. Alsharafyah campus clearly outperforms the other two with an average score of 17.31 and a smaller deviation.

Alsulaimanyah campus achieved an average score of 14.23 and Alsalamah comes right after with an average score

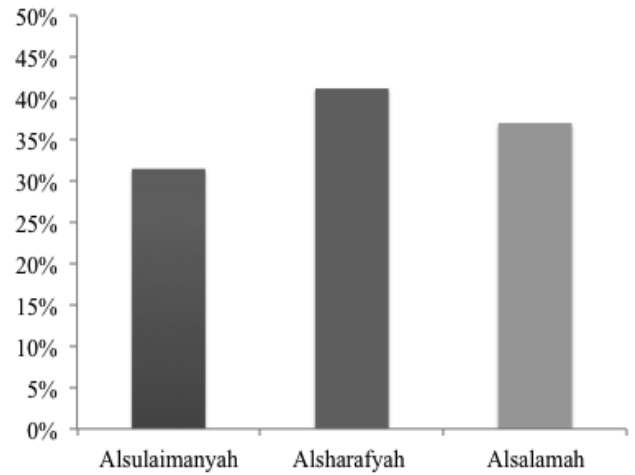


Fig 2 Percentage of correct answers by campus

of 13,23, although the latter shows more dispersion. Having such a different average score among campuses from the same university reveals an anomaly that we need to pay attention to.

Another interesting metric we monitored is the number of correct answers, shown in Fig 3, also distributed by campus and showing the average of all students as well.

Section A (questions 1 to 7) shows higher scores than section B (from question 8 on). Clearly average score goes down when the section B starts with question 8. Lower scores in section B might be caused by either by an increased difficulty or by different question type; while section A contains short questions, section B is comprised by a set of longer questions based on a case of study.

Some questions have been especially difficult for students. For instance, question 2.3 “Data entry clerks use a keyboard to enter text into a computer. Another method of entering text into a computer is.” only shows a correct answer percentage of 11%. Few students were able to state alternative text entering methods.

The figure also shows Alsharafyah campus performs better than the two other campuses, regardless of the

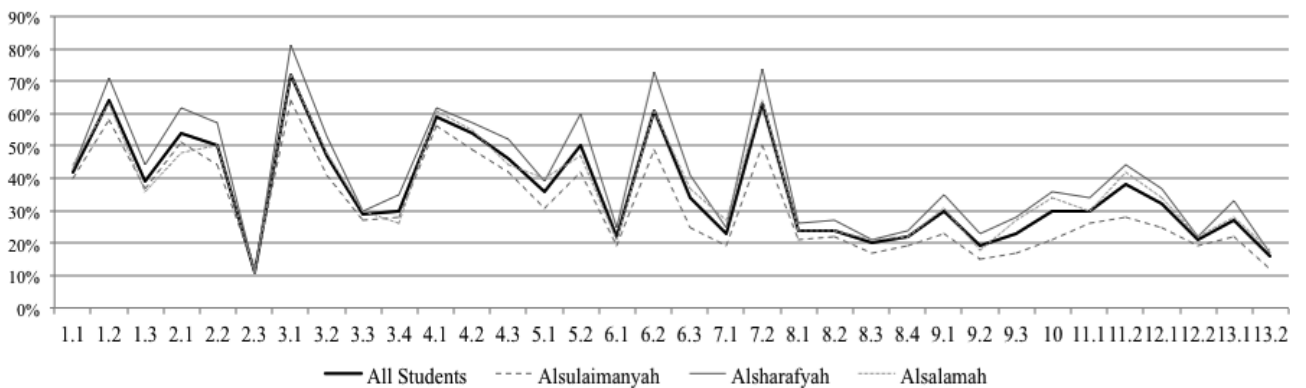


Fig 3 Average score by question for each campus

question. On the contrary, Alsulaimanyah campus gets the lowest score in almost all the questions. This can also be seen in Fig 2

With regard to the questionnaire, students were divided in three groups: scientific, administrative, and previous regular students. The questionnaire evaluates the following questions: use of computers in the student's daily life, student's expectation fulfilment, course outcomes achievements, students' command of MS Windows, student's command of MS Office. The latter three ask the students whether they think they would be capable of resolving a problem or they would need to ask for help.

Near 100% of students are used to perform tasks with their computers at home and at the school. Also almost all of the students have Internet connection in their houses.

With regard to course outcomes and aims, regular students do not show much confidence. Despite of the fact that 57% got the basic concepts and knowledge, only 21% acquired system administration and maintenance concepts, such as downloading and properly installing software without help, and only 22% thought he or she had fully understood computer programming.

Distance and external students show similar results, although performing a bit better on system administration concepts (27%) and not doing so well in basic knowledge (51%).

Course expectations were met for the 44% of the students, partly for the 48% and not met for the 8%.

In general, command of MS Windows shows good results. Regular students perform better than external & distance students. Basic Windows usage and tasks are well performed by more than 80% of the users, except for formatting the hard-drive and re-installing the operating system, which only was executed by a 48% of the students without help.

Microsoft Office also shows good results but not as high as Windows results. Easy tasks, such as writing an essay and using tables, charts and pictures are executed without help by more than 90% of the students. Working with analytical data and preparing presentations is done without help by more than 73% of the students. Finally, the hardest tasks for the students where database management, arranging appointments for meetings, create email groups.

Lastly, Fig 4 shows a slightly lower percentage of positive indicators in external and distance students, which can occur because of a lower engagement factor.

## VI. CONCLUSIONS

In this paper we described how we employed the GCE Ordinary level in computing qualification as a placement test. Also, a questionnaire has been given to the students to gather information about their daily use of new technologies and opinion about the process.

First question to address is why does one campus clearly performs better than others. It is important to perform a more exhaustive study on students' skills for each campus. High school grades need to be part of the equation to effectively

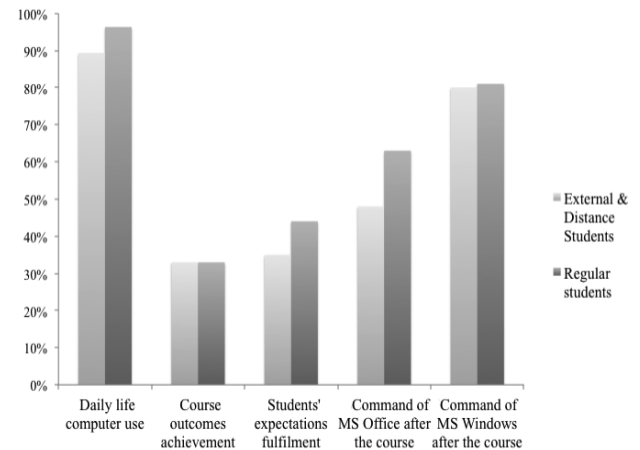


Fig 4 Final positive indicators

know if different campuses are receiving students with different levels. Social environment data would be also helpful to adapt campuses pedagogical methods if they are receiving students from areas with lower high school grades.

Moreover, Pearson GCE Ordinary level certificates are being replaced by the new International GCSEs, available from 2009. The equivalent for the old Computing certificate is the GCSE in Information and Communication Technology, updated to the requirements of modern society. In the future we plan to adapt the CPIT100 course new GCSE qualification.

With regard to placement test predictions, they need to be complemented with secondary education grades in subjects related to computing (namely, math, physics and computing) and students commitment during the preparatory course. Again, having information about the social environment will be important, especially to get more information about students daily use of information technologies. We must perform research on how to extract this data from the questionnaire and act accordingly. Thus, with such improved indicators we could know the kind and amount of homework that is given to students, based on the facilities they have at home.

As for level prediction rates we ought to assess the prediction rate of our approach by performing research on how students perform in the tasks that have been covered in the course. A good measure would be to correlate tests data with students skills on the specific topics covered during the course. However, before carrying out this assessment better student classification is needed for future exams, namely, get statistical data for scientific and administrative background students.

Finally, our GCE tests should be compared with results from other institutions that have also used the same tests. The comparison should be accompanied with social, environmental and educational information about the students of both institutions and consequently draw the correct conclusions. The main aim of this is to share knowledge and be aware of the areas we need to improve.

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