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Graduate Studies - A Second Chance, in Israel

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ABSTRACT :

The Open University of Israel offers M.Sc. studies in Computer Science for students with an undergraduate degree in Computer Science and a grade point average of at least 80. For those students who do not meet the requested average requirement, we offer a program which gives them an opportunity to improve their achievements. If the students prove capable, we accept them as regular students to the M.Sc. studies. In this paper we describe the achievements improvement program which we have been running for the last several years. We give some information as to the success of the students in the program. Furthermore, we followed these students to see if they can cope with graduate studies as well as the students who did meet the acceptance requirements..

INTRODUCTION :

1.1 Overview of Open Universities :

The combination of open university and single-mode distance education is not very common. By single-mode distance education, we mean higher education universities that teach only off-campus students; Open universities can be characterized by open admission and an opportunity given to every person for higher education. A comparison of several single-mode distance education universities can be found in Guri-Rosenblit (1999).

We have reviewed the websites of six well-established open and single-mode distance education universities ; - the UK Open University http://www3.open.ac.uk, the FernUniversität in Germany http://www.fernuni-hagen.de, Athabasca University in Canada http://www.athabascau.ca, the Open University of Hong Kong http://www.ouhk.edu.hk, Indira Gandhi National Open University http://www.ignou.ac.in, and the Universidad Nacional de Educación a Distancia in Spain http://www.uned.es.

The purpose of the search was to find which of them offer an M.Sc. in Computer Science (CS) or related fields, and what are the admission requirements for these programs. We found that ;

- The British Open University offers postgraduate programs in Software Development and Information Systems. There are no entry requirements for the postgraduate diploma courses, which lead up to the final M.Sc. research project and dissertation, but one must be suitably prepared for study at the professional level ;
- FernUniversitaet offers an M.Sc. in Computer Science. For graduates who took a substantial amount of mathematics and CS courses, there are no grade score admission requirements ;
- Athabasca University offers an M.Sc. in Information Systems program. For graduates in Computer Science, Information Systems or related areas, there are no grade score admission requirements ;
- The Open University of Hong Kong offers an M.Sc. program in Information

Technology with Internet Applications - MSCITIA for graduates with honors in computing or related fields. Graduates without honors are required to have at least one year of IT experience, or a Postgraduate Certificate in IT ;

- Indira Ghandi National Open University offers a master's degree in Computer Application (MCA). For graduates in Computer Science / Applications, there are no grade score admission requirements ;
- The Universidad Nacional de Educación a Distancia does not offer an M.Sc. in Computer Science.

We found that most of the open and single mode distance education universities do not require a minimum grade score for admission to their masters programs in CS. Until recently, the CS masters program at the Open University of Israel had a minimum grade admission requirement. Although we believe that there should be certain admission grade requirements in order to insure a high standard of studies, we highly value the opportunity of giving a second chance to those who wish to pursue graduate education.

1.2 The Open University of Israel :

The Open University of Israel (OUI) is an institution of higher learning which offers a variety of undergraduate programs and several graduate programs (http://www-e.openu.ac.il).

The OUI is a distance learning institution designed to offer academic studies to students throughout Israel and abroad. Authorized by the Israeli council for higher education to confer bachelors' and masters' degrees, the OUI offers about 500 courses in all of the major disciplines. Its home study system allows students from all over the country to pursue a higher education, whenever and wherever convenient. It combines expertly formulated and updated textbooks, 1000 tutors, and over 100 study centers throughout Israel. The students receive the course material in each course and are required to hand in exercises, projects and to take final exams.

The OUI is similar to other universities in its pursuit of excellence and its commitment to superior scientific and scholastic standards. However, it differs in that it is open to all those who wish to study towards a bachelor's degree. Enrollment does not require matriculation or any other achievement exam or certificate from any another educational institution. Although applicants are not required to provide proof of prior scholastic achievements, their academic achievements are the key to their success at the OUI.

In contrast to the open admissions policy for undergraduate studies, admission to graduate studies is contingent on fulfillment of certain requirements. Most of the graduate programs at the OUI require a grade point average of at least 80 (out of 100). In addition, some programs may have additional requirements, such as personal interviews.

1.2 Distance Education at the OUI :

The teaching methods practised at the OUI combine traditional and web-based distance education. These modes of education are based on many years of experience at the OUI in the undergraduate and graduate programs. This section describes both the traditional and web-based distance education at the OUI**.**

The traditional distance education and self-study practised at the OUI is not space or time dependent as it is not based on a central campus where lecturers and students gather. Courses offered by the OUI are fundamentally different from courses offered at other universities. The customary image of a course - a classroom with a teacher on the podium facing a group of students - does not apply to the OUI, or only partially. A course at the OUI is based on one or more volumes written and produced or especially selected for OUI students. Thus, learning at the OUI is first of all a self-study process based on written materials and not on sitting and listening to lectures. Each course includes an optional face-to-face component in the form of small group tutorials led by tutors.

The OUI also makes use of advanced technologies to improve its distance teaching which provide a wealth of learning

materials and continuous contact with faculty and other students in the course. All the courses at the OUI have course websites on the internet which provide an interactive learning environment. The websites include - among other things - additional materials, links to databases and internet sites related to the course material, as well as individual and group communication between students and tutors, and among the students themselves. It is important to emphasize that the websites do not replace the written study materials which constitute the core of the course, but expand and enrich them. The incorporation of web-based teaching methods is fully adapted to the written study material.

1.3 Msc in Computer Science :

The M.Sc. in Computer Science has been offered at the OUI since 1997. It offers two programs: a thesis program for outstanding students, and a non-thesis program.

The Degree requirements for the thesis program are ;

- The student must accumulate 30 credits of which no more than 9 are advanced undergraduate course credits in Computer Science.
- The program of study must include the course *Selected Topics in Algorithms* and one of the following advanced undergraduate courses: *Computability and Introduction to Complexity* or *Computational Complexity* (only if not taken as part of the student's undergraduate studies. Credits for this course are included in the advanced undergraduate course credit specified above).
- The program of study must include one graduate level seminar or one graduate level workshop. The credits for the seminar or workshop are included in the 30 credits required for the degree mentioned above.

Students must submit a thesis in addition to the 30 credits mentioned above. In the non- thesis program, students are required to accumulate 36 credits (instead of 30) of which no more than 12 are advanced under-graduate course credits in Computer Science, and to submit a final paper (instead of a thesis).

All graduate courses are 4 credit courses, while the seminars and workshops are 3 credits. Advanced undergraduate courses range from 3 to 6 credits depending on the extent of the material covered by the course.

All students begin their studies in the non-thesis program. Transferring to the thesis program is done at a later stage, after the student has earned at least 24 credits with a grade point average score of 90 or above.

Applicants who completed a B.A. or B.Sc. in CS with a grade point average of at least 80 (out of 100) are usually accepted to the program. In some cases they are required to take additional courses, depending on their undergraduate program http://www-e.openu.ac.il/master/01-cs.html.

Students can pace their studies according to their personal time constraints. They usually take one to three courses per semester. Students who suspend their studies of their own will for a period of more than two years are required to submit a request to the departmental Master's degree committee to resume their studies. The committee will consider the request on the basis of the student's academic achievements and additional information submitted by the student.

1.4 Open Admission :

For the last three years, we have been running an experiment in the CS department which gives a chance to students who completed a B.A. or B.Sc. in CS but whose average is lower than the requirement specified above, to try to improve their achievements and get accepted to the graduate program. We selected two courses from our graduate program ;- *Computability and Introduction to Complexity* and *Selected Topics in Algorithms*. The students are required to take these courses and achieve a grade point average of at least 75 (Benaya & Zur, 2004).

The course *Computability and Introduction to Complexity* is a graduate advanced course. At the moment this is an elective course for undergraduate students,

but mandatory for graduate students, who did not study it previously (we plan to turn it into a mandatory course in the undergraduate program). The course is the upper tier of a series of courses presenting the theoretical foundations of computer science at the undergraduate level. It is based on the text book *Computability, Complexity, and Languages: Fundamentals of Theoretical Computer Science*, by Davis, Sigal & Weyuker (1994).

The course *Selected Topics in Algorithms* is a graduate course. The course acquaints students with advanced data structures and their applications as well as with advanced algorithms in specific topics. The course deals with data structures which have become classics such as Fibonacci heaps, as well as well-known algorithms such as algorithms for string-matching, sorting networks, and for computational geometry. The course is based on the text book *Introduction to Algorithms*, by Cormen, Leiserson, & Rivest (2001).

In the above two courses, students study selected chapters of the course textbook accompanied by a study guide which includes solutions to problems in the book and additional material. The courses also have associated websites with additional tools and study materials.

The motivation for choosing these two courses as admission prerequisites for graduates with low scores involved the following reasoning ;

- The courses are highly demanding both with the reading material and the assignments, and the average scores are relatively low. One of the goals of this paper is to examine the assumption that high grades in the selected courses indicate high academic qualifications and therefore a good prediction for the chances of success in the M.Sc. program ;
- These two courses are a part of the mandatory courses of the M.Sc. program, so students can accumulate the credits for the graduate studies while attempting to improve their achievements ;
- These two courses reflect different and fundamental aspects of the CS studies: theory of computer science and algorithmic thinking.

2 METHODS AND RESULTS :

Since we started the experiment we have accepted 448 new students to the Masters' program in CS. These students met the admission requirements: undergraduate degree in CS with a grade point average of at least 80. During this period 109 students that didn't meet the admission requirements, were given the opportunity to try to improve their achievements by taking the two selected courses: "Computability and Introduction to Complexity" and "Selected Topics in Algorithms" and achieving a grade point average of at least 75. Out of this group of students, 75 students decided to try to improve their achievements.

We have been following this group of 75 students to see how many of them succeed to fulfill the requirements. We have checked the status of those students in the two courses, and we are presenting up-to-date results ;

- Success: 17 students (23%) succeeded in passing both courses with a grade point average of at least 75 and were accepted to the Masters' program in CS.
- High probability of success: 6 students (8%) have passed one of the courses and are enrolled in the second course, but we do not have their final results.
- Left the program: 3 students (4%) have passed one of the courses but have decided not to enroll in the second course.
- Failure: 35 students (46%) failed both courses, or failed one course and decided not to pursue the program.
- New students: 14 students (19%) were just accepted into the program or have just started the program by enrolling to one of the courses.

Overall, these results are presented below in Figure 1 showing the final status of the students in these achievement programs prior to enrolling in the graduate course.

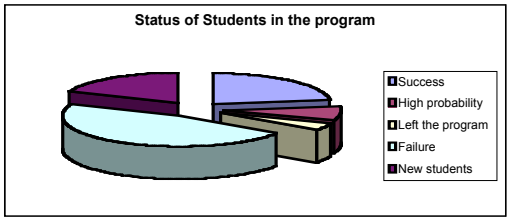

Figure 1 : Status of the students in the OUI achievement improvement programs

Furthermore, we have been following the above 17 students who succeeded in passing both courses with a grade point average of at least 75 and who were accepted into the CS master's program.

We found that all 17 students are successfully studying in the program ;-

- 4 students are in the beginning stages of the program - they have accumulated up to 10 credits.
- 5 students have accumulated between 11 and 20 credits.
- 8 students are in the advanced stages of the program - they have accumulated between 21 and 36 credits.

We have checked the grade point averages of these students and have found that a quarter of them have a grade point average between 70 and 79, one half of them have a grade point average between 80 and 89, and the other one quarter have a grade point average between 90 and 100.

3. DISCUSSION :

In this section, we analyze the above results and try to give some insight into the success rate of the program.

Our results show that 23% of the students succeeded in improving their achievements and getting accepted into the master's program; 8% of the students have passed one of the courses and therefore have a high probability of success; 4% of the students have left the program after passing one of the courses, and 46% of the students did not succeed in improving their achievements.

The relatively high failure rate could be attributed either to the under-qualifications of some of the applicants; or to the high level of the barrier which they were required to pass; or to a combination of both. We decided to explore whether the level of the barrier was too high or not.

To re-evaluate the barrier conditions, we examined the scores of all our graduate students in the two courses.

We found that from the 160 graduate students over the several years in the course *Computability and Introduction to Complexity,* 37 students dropped out before the final exam (23%). The average score of the remaining students was 70. Looking at the grades more closely, one can notice that the standard deviation is 21, which is very high. Only 42 students (34% of the students who took the exam) received a grade above 80; 25% of the students who took the exam received a grade below 60 (failed). The correlation between the grade in this course and the average grade in all other courses is significant but low ($r=0.226$, $p= 0.016$).

From the 392 graduate students over several years in the course *Selected Topics in Algorithms*, 110 students dropped out before the final exam (28%). The average score of the remaining students was 75. Looking at the grades more closely, one can notice that the standard deviation is 16.3 which is also very high. 112 students (40% of the students who took the exam) received a grade above 80; 25% of the students who took the exam received a grade below 65. The correlation between the grade in this course and the average grade in all other courses is significant but low ($r=0.186$, $p=0.02$).

In the light of the discussion presented above, we can see that achieving a grade of 80 or above in the course *Computability and Introduction to Complexity* is more difficult than achieving this grade in the course *Selected Topics in Algorithms*. In addition, the grades of the lower twenty-five percentile of the students in the course *Selected Topics in Algorithms* are slightly better than the grades of the lower twenty-five percentile of the students in the course *Computability and Introduction to Complexity.* These findings indicate that the requirement of achieving a grade of 75 in the course *Selected Topics in Algorithms*

was reasonable, while the requirement of achieving a grade of 75 in the course *Computability and Introduction to Complexity* was possibly too high.. Accordingly, a grade point average of 75 in these two courses was a realistic requirement, although perhaps difficult.

As we do wish to give a second chance to potential students, we are reconsidering an alternative course combination such as replacing the course *Computability and Introduction to Complexity* by another graduate-level course. We will select an alternative course according to its success rate and its potential indication of the student's success rate.

We plan to continue following the status of the students in the achievements improvement program in order to assess the success of our experiment. We also wish to further analyze the academic background of the students who succeeded in the program.

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