CHARACTERISTICS OF STUDENTS WHO FAILED (OR SUCCEEDED) THE INTRODUCTORY CS COURSE

Judith Gal-Ezer[1], Tamar Vilner[2], Ela Zur[3]

Abstract - The Open University of Israel, with its policy of open admissions, offers an undergraduate program of study in Computer Science. At the beginning of their studies, students take mathematics courses and the CS1 course "Introduction to Computer Science" which many students fail. This study attempts to identify characteristics which can predict success or failure in the course in order to identify students who are likely to fail. Assuming that students' background knowledge is a predictor of success, we chose to examine the relationship between students' prior knowledge and their success in the course. On the basis of our findings we will suggest ways to increase the pass rate in the course.

Index Terms - CS1, predictors of success and failure

BACKGROUND

The Open University of Israel is a distance-learning university with an open admissions policy. The introductory course in CS is among the first courses that undergraduate CS students take. It serves as "the proof of the pudding" to help students find out whether they are capable of coping with academic studies in CS.

We have observed that the percentage of students who do not complete the CS1 course is very high. Motivated by this and by studies which investigate possible predictors of success and failure of novice students taking CS1 [1, 2], we decided to carry out the following study.

THE STUDY

Our study aims to uncover the characteristics of students who drop out of or fail the CS1 course. The research questions are:
1. To what extent is there a connection between students' high school math background and their success in CS1?
2. To what extent is there a connection between programming experience and success in CS1?
3. Is there any connection between the frequency of use of various computer applications and success in CS1?

Research Instruments

During the Spring semester of 2003, about 900 students took the CS1 course. At the beginning of the semester, a questionnaire was administered to determine students' prior knowledge in mathematics, computer science, use of computer applications and frequency of use. The questionnaire included open and MC questions such as:

Do you have a computer at home? How often do you use the computer? How do you use the computer? Do you work in programming, and in what languages? What mathematics and computer science courses have you successfully completed at the Open University? What was your matriculation grade in mathematics and on what level did you study? (3-point = basic level; 4-point = intermediate; 5-point = advanced) What was your matriculation grade in computer science and on what level did you study? (3-point = basic; 5-point = advanced; 15-point = technological).

Partial Findings

The semester has not yet ended, and as a result we do not yet have final data regarding success or failure in the course. Questionnaires were return by 761 students. Of these, 95% of the students had PCs at home. Tables I-IV present our partial findings (with no analysis).

TABLE I
FREQUENCY OF COMPUTER USE (N = 761)

At least once a day	Several times a week	Several times a month	Less or once a month
79%	17%	2%	2%

TABLE II
KINDS OF COMPUTER USE (N = 761)

Word-processing	Surfing the net	Computer games	Educational software	Excel
59%	87%	46%	22%	35%

TABLE III
MATRICULATION BACKGROUND IN MATHEMATICS (N = 761)

3-point	4-point	5-point	None
24%	31%	31%	14%

TABLE IV
MATRICULATION BACKGROUND IN COMPUTER SCIENCE (N = 761)

3-point	5-point	15-point	Other	None
4%	10%	4%	4%	78%

PARTIAL CONCLUSIONS

On the basis of our findings, we will create a profile of students who are unlikely to succeed in CS1 and suggest ways to increase the pass rate in the course. We will report on the profile and our conclusions.

[1] Judith Gal-Ezer, The Open University of Israel, 16 Klausner Street, Tel Aviv, Israel 61392, galezer@openu.ac.il
[2] Tamar Vilner, The Open University of Israel, 16 Klausner Street, Tel Aviv, Israel 61392, tami@cs.openu.ac.il
[3] Ela Zur, The Open University of Israel, 16 Klausner Street, Tel Aviv, Israel 61392, ela@openu.ac.il

REFERENCES

[1] Rountree, N., Rountree, J., & Robins, A., "Identifying the danger zones: Predictors of success and failure in a CS1 course", *Technical ReportOUCS-2001-07*. http://www.cs.otago.ac.nz/trseries

[2] Bishop-Clark, C., "Cognitive style, personality, and computer programming", *Computers in Human Behavior,* 11(2), 1995, 241-260.