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Computer Programming COMP103: Who Does Better?

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Abstract

Students in Kathmandu University studying computer programming have varied backgrounds. Some students have studied computer, but some have no knowledge about computer basics. It's a very big challenge for the first-year students so called freshmen to have better performance in the course. It is found from the previous results that the students who fail in semester exam usually fail in programming course. So, this paper studies what sort of students tend to do better and what kind of students fail in programming. In addition, this paper also explains a small-scale empirical study on the students. The aim of this research is to explore the relationship between researcher's expectations and the students' attitude towards programming, their background, and academic achievement. The research work presents the result of a survey which focuses on students' backgrounds and their perception towards the course. In this study among various statistical analysis approaches chi-square test was selected. This test was performed on every question that was provided to students. The scale used for the measurement of various factors that may affect the performance of students was developed by the researcher. Scale was administered to 68 students who were taking introductory programming course from Computer science and Computer Engineering first semester. The results showed that there is a significant relationship between having computer programming background and the students' performance in programming.

Keywords: Academic Achievements; Computer Programming; Empirical Study; Freshmen; Kathmandu University

Introduction

Background

Department of computer science and engineering at the Kathmandu University offers computer programming as introductory course for the first-year students. It is offered as compulsory course for all the majors in the department of science and engineering and prerequisite for continuing in the department. The course runs over16weeks and covers about 500 students.

Learning computer programming is not an easy task, especially for the first semester students. High degree of failure of students is a strong indicator of difficulties faced by them.

An observation started to see what factors leading the extensive number of students towards failure in the first semester at Kathmandu University. These factors help us predict the success and failure of the students. For example, did any previous course of study, or their level of enthusiasm to take this course, their attitude towards the course, their strong determination to get success.

Problem Domain

Developing computer programming skill is very complex and challenging task. The rate of failure in computer programming course is highly observed among the first semester students in Kathmandu University. Unfortunately, no explicit measures are defined to predict the success and failure of students' performance. The reasons for failure of students could be credited to the fact that students come from poor computer background, lack of computer resources for practice, lack of interest or attitude. The prioritization of factors affecting the poor performance in computer programming is also not determined due to which the rate of failure of students is increasing every coming year, especially in computer programming course. These observations suggest a need for a study on various factors that might be helpful for predicting success and failure of the novice students and imply the results to review the university policy for a better overall performance of these students.

Objective

The primary objective of this research is to study the various factors that are affecting the performance of the first-year students on computer programming. Exploring relationship between those factors towards programming so that it could be possible to observe what category of students can have better performance in computer programming and what type come to fail.

Research Question

The specific question answered by the study is:

- Does the students background, their expectations, attitude, interest of taking the course and their surroundings affect their success in computer programming?

Literature Review

Computer science students generally take their introductory course in the first semester of their study. Motivating students properly to learn abstract programming concept is very difficult task and programming is generally considered as hard. Rapid dropout from learning computer programming has been observed when the actual concept and skills begin even if students have initial enthusiasm for computers(Farkas & Murthy).It also has been noticed that computer programming course has high dropout rate since the course is considered hard to entertain.

Variety of study have been conducted to study on the factors behind success/failure of students in computer programming. The research (Mutka)has been carried out to identify the characteristics of the novice programmer and they found that novice programmer lacks the knowledge and skills of programming. To be a good programmer it requires a lot of practices which is only possible when the students get motivated. Cognitive, behavioral and attitudinal factors indicate visualization and reasoning, the ability to articulate strategies for commonplace search and design tasks, and attitudes to studying respectively (Raadt, et al., 2006). The finding indicates that deep approach to learning is positively correlated with

marks for the course, spatial visualization skills are correlated with success and increasing ability to articulate leads to higher marks achievements. Papers (Liu, Goctze, & Glynn)(Kölling) discusses various factors that affect in learnig object oriented programming.

Attitude found to be a significant factor to have better performance in computer programming in the study (Baser, 2013). The research(Rountree, Rountree, & Robins) conducted a survey on backgrounds and expectations of group of computer science first semester students, compared their answers with their final grades on the course. The result was that students who were intended to continue the computer science program did no better than others. “Expecting to get an A from the course” found to be only the indicator of success.The paper(Du, Wimm]=er, & Rada, 2016) investigated impact of “Hour of code”on students’ attitudes towards computer programming and their knowledge of programming.One hour introduction to computer science was completed with a sample of undergraduate students from the university. “Hour of code” tutorialfound to have positive impact on students attitude towards programming. However significance change in programming skills did not found. In the year of 2003-2004 a study (Bergin & Reilly)was carried out to see factors that influence the first year object oriented programming module. Some of the factors among fifteen factors that the research included wereprior academic experience, priorcomputer experience, self-perception of programming performanceand comfort level on the module and specific cognitiveskills.The study found that a student’s perception oftheir understanding of the module had the strongest correlationwith programming performance.Also, Leaving Certificate mathematics and sciencescores were shown to have a strong correlation withperformance.

Certain studies are carried out regarding gender difference in computer programming.Existence of gender difference is suggested when it comes to performance measurements(Morris & Trushell, 2014).The study(AKINOLA S. O., 2015)reveals that gender difference does not play an important role in the programming.No signifaicant effect regarding gender difference has been observedin progrming(Wilson, 2002).

Numbers of research have been conducted regrading the study on improving students participation in computer programming. Paper (Konecki, Lovrenčić, & Kaniški) used real projects to show students, the outcomes of learning inorder to motivate them towards programmming. A critical factor distinguishing a novice programmer from an expert is ability to plan (Bailie). So If modularization skill of novice programmer could be improved, outcome may be as expected. The research study(Law a,b,*, Lee c, & Yu c, 2010) investigates the key motivating factors that affects the learning of university undergraduate students taking computer programming courses. The factors are supposed to be self-efficacy, individual expectation, clear direction, and reward and recognition. The result suggested that well facilitated e-learning setting can enhance learning motivation and self efficacy.

Research Methodology

Online Survey

This research was conducted among second semester students from the department of computer science and engineering in the Kathmandu University. Survey was performed in the first week of the second semester. Students were asked to complete an online survey questionnaire form which consisted 11 questions some with multiple choice option and others were with short answers in numerical form. The sample was taken from Computer Engineering and Computer Science groups belonging to Department of Computer Science and Engineering, Kathmandu University. Total of 120 questionnaire were sent to students

among which only 68 responded. The questionnaire was provided to students via Google form.

Requested questionnaire was regarding:

- Background knowledge: Before joining KU, did they study computer courses, before joining KU, did they take any computer programming (Qbasic, C etc.), students'average math score in +2 level, if they were "A" level student, their equivalent percentage, their average score in +2 level.
- Surroundings: Whether they had their own laptop or computer when they were first semester students, whether they had family members from computer background.
- Interest: When entering KU, was computer science and engineering their priority, how much they were interested in computer programming.
- Attitude: How determined they were to get highest score in COMP103.
- Learning style: Did they practice programming in group, did they practice programming beyond syllabus of COMP103.

Duplicate replies were excluded from the survey data. It is assumed that majority of students answered the survey honestly. Students' answers from the survey were then compared with marks of the internal evaluation.

X^2 – test was performed on every question from above category. We assumed marks gained between 20-30 as fair, 30-40 as good and 40-50 as excellent. The test was performed with 10% of significance level. From this test we found that students having computer programming background tend to do better in COMP103. With other factors no relationship found.

	Question	Category	Value of X^2	Critical value at 10% level of significance	Degree of freedom(DF)
BACKGROUND KNOWLEDGE	Programming Knowledge Before	Yes, No	5.53	4.605	2
	Knowledge of Computer before	Yes, No	0.497	4.605	2
	Math Score at +2	Distinction, First, Second	6.998	7.779	4
	Average Score at +2	Distinction, First, Second	0.491	7.779	4
SURROUNDINGS	Have Comp/Laptop	Yes, No	3.842	4.605	2
	Comp Background family	Yes, No	0.61	4.605	2
INTEREST	Comp Sci/Engg with 1st Priority	Yes, No	2.499	4.605	2

	Interest in Programming	Neutral, Interested, very much Interested	6.124	7.779	4
ATTITUDE	Determination of Achieving higher grades	Yes, No	0.875	4.605	2
LEARNING STYLE	Practice in group	Yes, No	0.008	4.605	2
	Programming Beyond Syllabus	Yes, No	0.16	4.605	2

Table 1: Summary of X^2– teston each survey question.

Some of the results found are:

- Quiet surprising was that students expecting higher grade were supposed to do better in COMP103, but the analysis showed there was no relation between them.
- Success results seem to be independent of learning style, students' interest and their surroundings.
- As expected, students who had studied computer programming before KU did better in COMP103.

Discussion

Discussion	Research questions	Answers		
		Fair	Good	Excellent
Clearly students having computer programming background did better than those who did not have.	Before joining KU, have you studied computer programming (Qbasic, C etc.)?	No: 5 Yes: 2	No: 15 Yes: 24	No: 5 Yes: 17
Having only basic computer background did not affect their performance in comp 103.	Those who have knowledge of computer during +2 level score better in Computer Programming course	No: 4 Yes: 3	No: 21 Yes: 18	No: 10 Yes: 12

Surprisingly no relation found between mathematical knowledge and programming performance. Instead the one who seem weak in mathematics performed better in programming.	What is your average math score in +2 level? If you are A level student, please enter your grade into equivalent percentage.	Distinction: 2 First: 5 Second: 0	Distinction:14 First: 25 Second: 0	Distinction: 8 First:11 Second: 3
Average students in +2 found to do better in computer programming.	What was your average score in +2 level?	Distinction: 1 First: 5 Second: 1	Distinction: 9 First: 25 Second: 5	Distinction: 5 First: 15 Second: 2
It is suggested that those who have computer or laptop tend to do better in computer programming.	Did you have your own laptop or computer when you were in first year first semester?	No: 1 Yes: 6	No: 1 Yes: 28	No: 1 Yes: 22
There is no relation between having family member and doing better in programming.	Do you have anyone in your family who has computer background?	No: 4 Yes: 3	No: 28 Yes: 11	No: 15 Yes: 7
From the data presented here it is seen that whose priority was computer science and engineering did better than those who's not.	When entering into KU, was Computer Science and Engineering your priority?	No: 1 Yes: 6	No: 3 Yes: 36	No: 0 Yes: 22
Students very much interested in programming seem to have better performance.	How much are you interested in Computer Programming?	Neutral: 0 Interested: 5 Very much interested: 2	Neutral: 1 Interested:11 Very much interested: 27	Neutral: 0 Interested: 6 Very much interested:16

Students who expect to get higher score are more likely to be successful.	Were you determined to score higher grade in COMP 103?	Not determined: 1 Determined: 6	Not determined: 2 Determined: 37	Not determined: 2 Determined : 20
Discussing in group helps to be successful in computer programming.	Did you practice programming in a group with other friends?	No: 2 Yes: 5	No: 11 Yes: 28	No: 6 Yes: 16
There is no much difference in success of those who go beyond syllabus for practice than those who do not.	Did you practice programming beyond syllabus of COMP 103?	No: 3 Yes: 4	No: 16 Yes: 23	No: 8 Yes: 14

Conclusion

Survey results are presented here which had been conducted on two groups of students (computer science and computer engineering) taking C Programming as introductory programming course. The research has been carried out to see if there were any factors affecting the success of students. For the purpose, various factors were determined. Among which, from chi-square test it was found that having computer programming background students supposed to do better in COMP103.Other factors were not seemed to have better effect on students' achievements.

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