

Investigating Difficulties of Learning Computer Programming in Saudi Arabia

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Abstract Learning computer programming is one of the main requirements of many educational study plans in higher education. Research has shown that many students face difficulties acquiring reasonable programming skills during their first year of college. In Saudi Arabia, there are twenty-three state-owned universities scattered around the country that provide free college education for Saudi students. Through a quick glance at the website of these universities, we found out that almost all of them offer the same course description and requirements for the computer-programming course. The poor performance of students in these programming courses, however, is always a hot topic during educational gathering held on the country; it is always mentioned that students' performances differ from a university to another and between different regions of the country. The main objective of this research is to investigate the reasons behind the major discrepancies in the performance of students in computer programming course in three main regions of Saudi Arabia: East, West and North. For the purpose of this research, we designed a questionnaire to be filled by a random sample of students from each region considered in this study. The questions on this questioner are related to a set of indices such as socio-economic indices, learning environments indices, and the quality of teaching offered indexes. This paper presents our findings on the difficulties students face while learning computer programming in some regions of Saudi Arabia.

Keywords Computer Programming, Learning Difficulties, Socio-economic Indices, Learning Environment Indices

1. Introduction ♦

Learning computer programming is one of the main requirements of many educational study plans in higher

education [1]. Research has shown that many students face difficulties acquiring reasonable programming skills during their first year of college [2]-[4], and that learning computer programming is very complicated for many students at the first year of college [5].

Computer programming is difficult because students struggle to capture the required abstract concepts that are necessary to a program construction. The main source of difficulty does not appear to be the syntax or understanding of concepts but rather basic program's planning [6]. Research shows that introductory programming courses have a relatively high fail rate. For example, Hagan in [7] states that programming was considered to be the most difficult and least interesting subject by most first-year students in all computing courses. Additionally, many institutes report dropout rates of 20-40 percent [8]-[14]. Because of the importance of computer programming and the difficulties faced by the college students, this topic has been investigated by many authors, e.g., [15]-[27].

In Saudi Arabia, there are twenty-three state-owned universities scattered around the country that provide free college education for Saudi students. Through a quick glance at the website of these universities, we found out that almost all of them offer the same course description and requirements for the computer-programming course. The poor performance of students in these programming courses, however, is always a hot topic during educational gathering held on the country; it is always mentioned that students' performances differ from a university to another and between different regions of the country. The main objective of this research is to investigate the reasons behind the major discrepancies in the performance of students in computer programming course in three main regions of Saudi Arabia: East, West and North. For the purpose of this research, we designed a questionnaire to be filled by a random sample students from each region determined for this study. The questions on this questioner are related to the socio-economic indices, learning environments indices, and the quality of teaching offered indexes. The results of the filled questionnaires will be analyzed and the results will reported in this paper.

♦ An earlier version of this paper was presented at the 13th Annual Hawaii International Conference on Education, January 5-8, 2015, Honolulu, Hawaii, USA.

The rest of this paper is organized as follows. In Section 2, we provide a background and our motivation for this research. Section 3 presents the survey used from the purpose of this study. A discussion of the results obtained by analyzing survey's results is provided in Section 4. Conclusions and our plans for future work are outlined in Section 5. Appendix 1 includes the survey used for the purpose of this research.

2. Background and Motivation

Saudi Arabia is an oil rich third world country that is located in the southwest corner of Asia [24, 25]. According to 2010 statistics, the population of the country is approximately 27 million [24]. Out of the twenty seven millions approximately 19 million are Saudis and the rest are foreign workers. The area of Saudi Arabia is approximately 2, 150, 000 square kilometers. The country is divided into five main regions: Eastern Region (ER), Western Region (WR), Central Region (CR), Northern Region (NR), and Southern Region (SR). The capital of Saudi Arabia, Riyadh, is located in the central region and the home of main government offices. Therefore, Riyadh has the lion share of development projects and government spending. King Saud University (KSU) [26], the oldest and the largest university in Saudi Arabia, is located in Riyadh. In the early days of the country, before the oil is produced in large quantities in the early seventies of the 19th century, many Saudis have migrated to Riyadh looking for work and better life.

The Eastern Region (ER) is the source of oil and natural gas and consequentially the home of most oil and gas related companies. The largest city in ER is Dammam which has the first oil field ever discovered in Saudi Arabia. After oil is produced in large quantity, in the seventies, ER was booming and became the favorite destination for Saudis looking for good paying jobs. Saudi Aramco [27], one of the main oil and gas companies in the world, is located in Dhahran city within the eastern region. From the early seventies until now, Saudi Aramco continued to employ and train Saudi youths in the fields of oil and gas industries. The company is known for its rigorous educational programs which are conducted domestically and in the United States. Additionally, SABIC [28] is located in the city of Jubail, eastern Saudi Arabia. SABIC, a state owned company, is one of the world's leading companies in the field of petrochemical industries. Saudi Aramco and SABIC has played a major role in the development and prosperity of the country across all aspects of life. On the field of education, school developed and managed by these two companies have been known to be the best and better quality as compared to other public and private schools in the country.

The holy city of Islam, Mecca, is located in the Western Region (WR). Also, the coastal city of Jeddah is a neighboring of Mecca and is located in the cost of the Red Sea. Jeddah is a heavily populated city and one of the most developed and modern cities in Saudi Arabia. Jeddah is the

home of King Abdulaziz University (KAU) [29] which is the second largest university in the country. Because Muslims come to Mecca and Jeddah every year during the Hajj (Islamic Pilgrimages) season, the population of Mecca and Jeddah are originated from various ethnics and came from many different places in the world. This diversity in population backgrounds, gave the people of Mecca and Jeddah special identity that is different from people in other regions in the country.

The Northern Region (NR) of Saudi Arabia is located on the borders of Jordan and Iraq. Tabuk city, which lies on the borders of Saudi Arabia with Jordan, is one of the major and most developed city on the NR. Tabuk is the home of one of the largest military base in the country. Therefore, most citizens here are employed by this military facility. University of Tabuk is also located in this city. Additionally, Tabuk is considered one of the major agricultural cities in Saudi Arabia.

The Southern Region (SR) of Saudi Arabia lies on the border of Yemen. Major cities on the southern region are Najran, Abha, Jazan, and Baha. In each one these cities, there is a public university. Compared to other regions of Saudi Arabia, Northern and Southern Regions are the least developed. Therefore, educated people of these two regions mostly opt to migrate to other developed regions of the country, looking for lucrative jobs and better quality of life.

The main objective of this research is to investigate the reasons behind the discrepancies in the learning outcomes of learning computer programming among students from different regions in Saudi Arabia. In other words, we want to know why student's final grades, in computer programming course, differ greatly among different region of the country although the same course is given in all regions. This research will concentrate on studying the impact of socio-economic and learning environments factors on the learning of computer programming in three main regions of Saudi Arabia: Central Region, Western Region, and Northern Region.

In this research, we are only trying to search for some factors that might have been causing students to face difficulties while learning computer programming in Saudi Arabia. In this aspect, we are not searching for or suggesting any concrete solutions to these factors. However, in the conclusion of this paper, we listed some recommendations based on our observations of the results of this study. Searching for solutions for these problems is beyond the scope of this research and requires further research in the field of teaching methods and a great attention form the concerned educational authorities in the country.

3. The Survey

In order to conduct our study, we have designed a survey as shown in Appendix 1. In this survey, we included thirty questions that are distributed among different socio-economic and learning environments indices, as

shown in Table 1, which we chose to measure in this study. Surveys are then distributed to three sets of second year college's students' form the three regions covered by this study as follows.

- Students are chosen randomly and their identity stays anonymous.
- Students are sub-grouped based on the region of the country where they study.
- Teachers are not involved in this survey.
- For data validation purposes, all uncompleted questioners and those with multiple answers were excluded.

Specifically, a total of 99 copies of the survey are such that these copies are divided evenly among three regions as follows. 33 copies are handed to three different sets of students from King Saud University in the CR, King Abdulaziz University in the WR, and University of Tabuk in the NR.

Table 1. Survey Main Indices

No.	Index	Questions
1	Socio-Economic	1-17
2	Learning Environment	18-30

4. Discussion

After surveys have been collected, only 90 copies of the survey that were filled properly are considered for analysis. For our analysis, we have used the SPSS statistical package, and employed descriptive analyses tools to obtain some statistical data such as Frequencies and Percentages, Mean and Standard Deviations values. Table 1 shows frequency and percentages data, while Table 3 shows mean and standard deviation data.

From the data shown in Table 2 and Table 3, we can deduce the following factors that might impact the learning of computer programming.

Some factors that may have positive impact on the ability of students to learn computer programming are:

- The desire of students to use computers in the first place.

- The ability of parents to use computers.
- The importance of having a computer at the house for doing homework.
- The importance of the parents following up with their students about their school work.
- The importance of providing the student with his own space to study at the house.
- The nature of the job of the father.
- The level of education of the father
- Instructor's ability to make the lecture more interesting and interactive.
- The ability of instructors to solve working examples with students during lectures.
- Giving enough homework to cover all the topics of the course.
- The importance of giving students open access time to the computer lab to practice and do their homework.
- The importance of penalizing students for not doing their homework.
- The importance of providing students with assistance during lab hours by their lab's instructor.

Some factors that may have negative impact on the ability of students to learn computer programming are:

- Not spending enough lab hours by students to practice and do their homework.
- Instructor's dullness during lectures and inability to draw student's attention during lectures.
- Living with friends may distract students from doing homework.
- The inability of both parents to know how to use computers.
- Not having a computer in the house to help in doing homework and practice more.
- The lack of knowledge of parents about computer programming.

Some factors that have no or very little impact on the ability of students to learn computer programming are:

- The monthly income of the father.
- Whether the parents are divorced or not.
- Whether the mother is employed or not.
- The age of the student.

Table 2. Survey's Frequencies and Percentages Statistical Results

Question's No.	Question's Text	Frequency	Percentage
Scio-Economic			
1	What is your region: <ul style="list-style-type: none"> • Central Region • Western Region • Northern Region 	30 30 30	33% 33% 33%
2	What is your age? <ul style="list-style-type: none"> • In the range of 19-23 • In the range of 24- 28 • In the range of 29-32 • More than 32 	79 11 0 0	88% 12% 0% 0%
3	Where do you live? <ul style="list-style-type: none"> • In the dormitory • With my parents • With my friends • I live alone 	13 37 28 12	14% 41% 31% 13%
4	Who is supporting you financially? <ul style="list-style-type: none"> • My father • My mother • My relatives • I support my self 	85 5 0 0	94% 6% 0% 0%
5	Are both of your parents alive? <ul style="list-style-type: none"> • Yes • No 	80 10	89% 11%
6	Are your parents divorced? <ul style="list-style-type: none"> • Yes • No 	7 83	8% 92%
7	What is your father's education? <ul style="list-style-type: none"> • Ph.D. degree • Master degree • College degree • High school degree • Below high school 	9 6 44 29 2	10% 7% 49% 32% 2%
8	What is the nature of your father's job? <ul style="list-style-type: none"> • Government civil employee • Government military employee • Government police employee • Private sector employee • Self-employed 	31 15 18 20 6	34% 17% 20% 22% 7%
9	What is the monthly income of your father? <ul style="list-style-type: none"> • 10,000 S.R. or More • 8000 S.R. • 5000 S.R. • Less than 5000 S.R. 	51 35 4 0	57% 39% 4% 0%
10	What is your mother's education? <ul style="list-style-type: none"> • Ph.D. degree • Master degree • College degree • High school degree • Below high school 	0 0 20 60 10	0% 0% 22% 67% 11%
11	Is your mother employed? <ul style="list-style-type: none"> • Yes • No 	15 75	17% 83%
12	Does either of your parents know how to use a computer? <ul style="list-style-type: none"> • Yes • No 	62 28	69% 31%
13	Do you have a computer at your house? <ul style="list-style-type: none"> • Yes • No 	43 47	48% 52%
14	How often do your parents ask about your school's work? <ul style="list-style-type: none"> • Daily • Weekly • Monthly • Not at all 	2 12 18 58	2% 13% 20% 64%

15	Does either of your parents know computer programming? <ul style="list-style-type: none"> • Yes • No 	3 87	3% 97%
16	Do you have your own and private space to study at your house? <ul style="list-style-type: none"> • Yes • No 	23 67	26% 74%
17	Do you like to use computers? <ul style="list-style-type: none"> • Yes • No 	39 51	43% 57%
Learning Environment			
18	How would you rate your instructor's lectures? <ul style="list-style-type: none"> • Excellent • Very good • Good • Poor 	2 9 16 63	2% 10% 18% 70%
19	How would you rate your understating of the subject after each lecture? <ul style="list-style-type: none"> • Excellent • Very good • Good • Poor 	1 7 11 71	1% 8% 12% 79%
20	Does your instructor interact with students during his lecture? <ul style="list-style-type: none"> • Always • Sometimes • Never 	0 22 68	0% 24% 76%
21	Does your instructor solve with you working examples during the lecture? <ul style="list-style-type: none"> • Yes • No 	17 73	19% 81%
22	Does your instructor give you homework after each new topic? <ul style="list-style-type: none"> • Yes • No 	8 82	9% 91%
23	Does your instructor penalize you for not doing your homework? <ul style="list-style-type: none"> • Yes • No 	38 52	42% 58%
24	Does your instructor solve all homework with you? <ul style="list-style-type: none"> • Yes • No 	16 74	18% 82%
25	How would you rate the benefits of your computer lab for this course? <ul style="list-style-type: none"> • Very helpful • Helpful • Not helpful 	9 33 48	10% 37% 53%
26	How often do you go to the computer's lab? <ul style="list-style-type: none"> • 2 hours weekly • 4 hours weekly • More than 4 hours weekly 	36 49 5	40% 54% 6%
27	Do you get any assistance from your lab's instructor? <ul style="list-style-type: none"> • Always • Sometimes • Never 	19 49 22	21% 54% 24%
28	Do you have access to the computer lab all the times? <ul style="list-style-type: none"> • Yes • No 	0 90	0% 100%
29	Does your school have enough resources for this course in the library? <ul style="list-style-type: none"> • Yes • No 	27 63	30% 70%
30	Do you feel that the learning environment is suitable and maintained properly? <ul style="list-style-type: none"> • Yes • No 	31 59	34% 66%

Referring to Table 2 and statistical data depicted in Fig. 1 and Fig 2, we notice that the mean of the survey's questions 2, 4, 8, and 9 is very high. This indicates that there is uniformity in the average age of college students across different regions of Saudi Arabia and in the average income of the main supporter of the student, i.e. the father. In addition, the same set of questions except for question no. 8, have a relatively small standard deviation, which indicate that their values are closer to the mean, on average. This result is not surprising and very consistent, considering that 71% of students participated in this study has a father who is a government employee as indicated by question no. 8. Additionally, 94% of students have their father as the main supporter, as pointed out by question no. 4 of the survey. The reason for this consistency is that government employees' salaries are standardized in Saudi Arabia and have no difference from one region of the country to another. This last point is also reflected by the small value of the standard deviation of question no. 9, as shown in Fig. 2. Statistically, this result is important because it indicates that learning environment factors may be more important for the purpose of this study. Therefore, we shall concentrate our discussion on learning environment indices as represented by survey's questions 18-30 shown earlier in Table 1.

As indicated by statistical data depicted in Table 2, Fig. 1 and Fig. 2, the small percentage of time that students spend for practicing their learned programming skills is obvious. For example, students do not have free access to university's computing facilities at all the times in the universities covered by this study, as indicated by question no. 28 of the survey. Additionally, the time spent by students on computing labs for practice is scares as indicated by question no. 26 of the survey. Furthermore, our study shows that available library resources are not adequate, and that lab equipment's are not properly and regularly maintained.

Small amount of time spent by instructors for helping students during laboratory sessions is reflected by our statistical data; only 21% of students said that they receive assistance during lab sessions. The lack of homework assignments given to students is also a major factor; 91% of students said that they never get homework after new topics. Furthermore, the lack of assistance by instructors in solving homework with students is a major complaint by students. In this respect, 82% of students expressed that their instructors never solve their homework assignments with them after handing them over. This is really a major problem, because a student needs to know the correct

answer in order for him to learn from his mistakes. Note that these results are region dependent as indicated by the values of the standard deviation depicted in Fig. 2.

5. Conclusions and Future Research

This paper presented a study that have been conducted to investigate some factors that may impact the process of learning computer programming in some regions of Saudi Arabia. For the purpose of this research, a survey was designed and distributed to a random set of college students in three different regions of Saudi Arabia. This survey included questions related to socio-economic issues and others related to learning environment issues. Data collected by this survey have been analyzed using known statistical methods and the results were presented. It should be noted that the objective of this research was not to search for solutions for the problems causing difficulties of computer programming in Saudi Arabia. Instead, this research is only an attempt to find out some factors that might have been causing students to face difficulties while learning computer programming in Saudi Arabia. Therefore, searching for solutions for these problems is beyond the scope of this research and requires further research in the field of teaching methods and a great attention form the concerned educational authorities in the country. Based on the results obtained by this analysis, we can confidently draw some initial conclusions that may truly influence the learning of computer programming in some regions of Saudi Arabia:

- The time allocated for laboratories and tutorial sessions is not adequate.
- The quantity and quality of homework assignments are not adequate.
- The process of instructor's selection and appointment to teach programming courses is not getting the administrative attention it should receive.
- The competency of instructor's abilities to motivate students for learning is questionable.
- The negative affect of the absence of quality assurance and monitoring methods, on the teaching process, may be one the main problems.

For our future works, we intend to perform more surveys in different regions of Saudi Arabia other than the ones covered by this paper, and compare their results with the our findings obtained by this study.

Table 3. Mean and Standard Deviation of Survey's Main Indices

Question's No.	Question's Text	Mean	Standard Deviation
Scio-Economic			
2	What is your age?	3.88	0.33
3	Where do you live?	2.87	0.82
4	Who is supporting you financially?	3.94	0.23
5	Are both of your parents alive?	0.89	0.32
6	Are your parents divorced?	0.08	0.27
7	What is your father's education?	2.90	0.94
8	What is the nature of your father's job?	3.53	0.85
9	What is the monthly income of your father?	3.52	0.58
10	What is your mother's education?	2.11	0.57
11	Is your mother employed?	0.17	0.37
12	Does either of your parents know how to use a computer?	0.69	0.47
13	Do you have a computer at your house?	0.48	0.50
14	How often do your parents ask about your school's work?	1.53	0.81
15	Does either of your parents know computer programming?	0.03	0.18
16	Do you have your own and private space to study at your house?	0.26	0.44
17	Do you like to use computers?	0.43	0.50
Learning Environment			
18	How would you rate your instructor's lectures?	1.44	0.77
19	How would you rate your understating of the subject after each lecture?	1.31	0.66
20	Does your instructor interact with students during his lecture?	1.24	0.43
21	Does your instructor solve with you working examples during the lecture?	0.19	0.39
22	Does your instructor give you homework after each new topic?	0.09	0.29
23	Does your instructor penalize your for not doing your homework?	0.42	0.50
24	Does your instructor solve all homework with you?	0.18	0.38
25	How would you rate the benefits of your computer lab for this course?	1.57	0.67
26	How often do you go to the computer's lab?	1.66	0.58
27	Do you get any assistance from your lab's instructor?	1.97	0.68
28	Do you have access to the computer lab all the times?	0.00	0.00
29	Does your school have enough resources for this course in the library?	0.30	0.46
30	Do you feel that the learning environment is suitable and maintained properly?	0.34	0.48

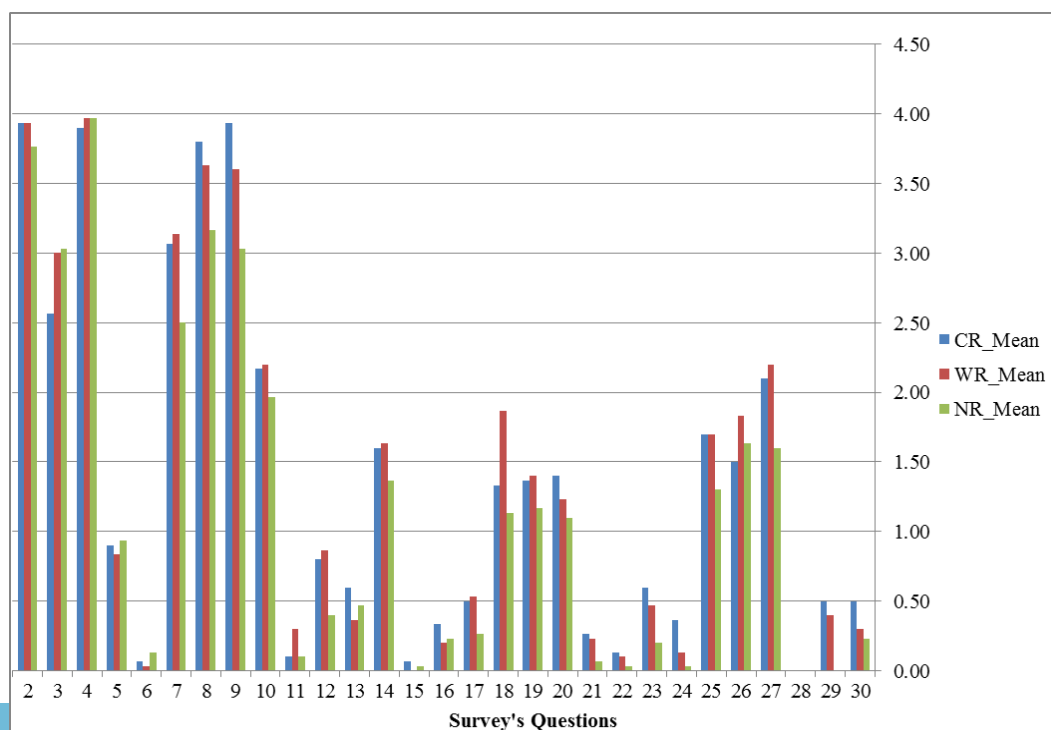


Figure 1. Cross-Regions Mean Statistics

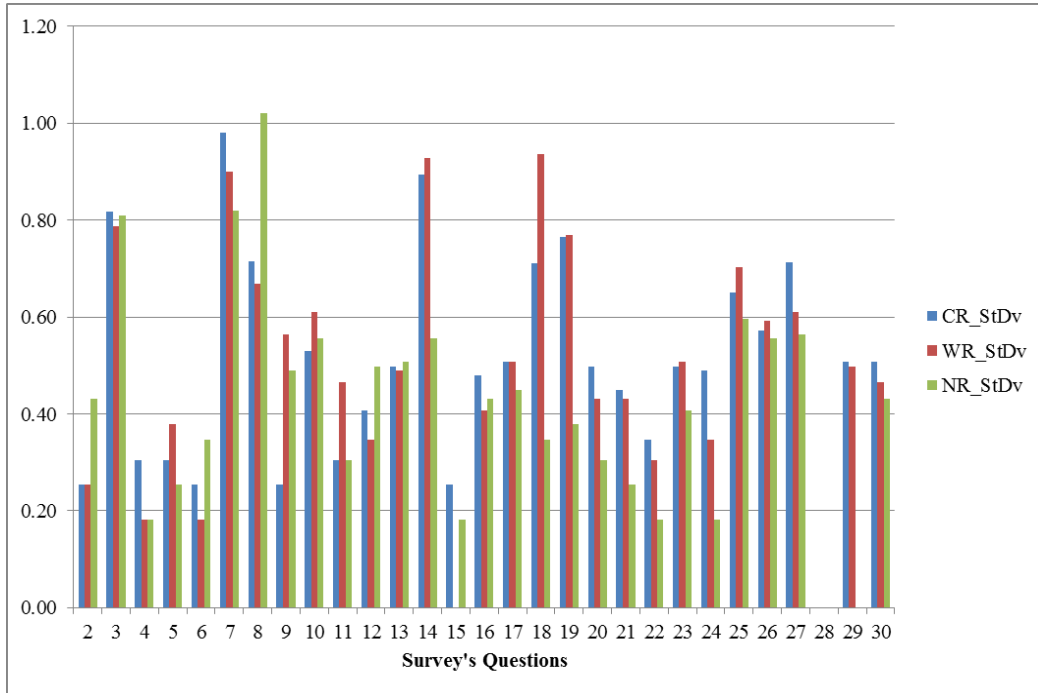


Figure 2. Cross-Regions Standard Deviation Statistics

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Appendix 1: The Survey

Dear Student:

Question No.	Question's Text
This survey is designed to investigate the discrepancies in the learning outcomes of learning computer programming among students from different regions in Saudi Arabia. Please answer all questions as directed by each question.	
Scio-Economic	
1	What is your region: <ul style="list-style-type: none"> • Central Region • Western Region • Northern Region
2	What is your age? <ul style="list-style-type: none"> • In the range of 19-23 • In the range of 24- 28 • In the range of 29-32 • More than 32
3	<ul style="list-style-type: none"> • Where do you live? • In the dormitory • With my parents • With my friends • I live alone
4	Who is supporting you financially? <ul style="list-style-type: none"> • My father • My mother • My relatives • I support my self
5	Are both of your parents alive? <ul style="list-style-type: none"> • Yes

	<ul style="list-style-type: none"> No
6	Are your parents divorced? <ul style="list-style-type: none"> Yes No
7	What is your father's education? <ul style="list-style-type: none"> Ph.D. degree Master degree College degree High school degree Below high school
8	What is the nature of your father's job? <ul style="list-style-type: none"> Government civil employee Government military employee Government police employee Private sector employee Self-employed
9	What is the monthly income of your father? <ul style="list-style-type: none"> 10,000 S.R. or More 8000 S.R. 5000 S.R. Less than 5000 S.R.
10	What is your mother's education? <ul style="list-style-type: none"> Ph.D. degree Master degree College degree High school degree Below high school
11	Is your mother employed? <ul style="list-style-type: none"> Yes No
12	Does either of your parents know how to use a computer? <ul style="list-style-type: none"> Yes No
13	Do you have a computer at your house? <ul style="list-style-type: none"> Yes No
14	How often do your parents ask about your school's work? <ul style="list-style-type: none"> Daily Weekly Monthly Not at all
15	Does either of your parents know computer programming? <ul style="list-style-type: none"> Yes No
16	Do you have your own and private space to study at your house? <ul style="list-style-type: none"> Yes No
17	Do you like to use computers? <ul style="list-style-type: none"> Yes No
Learning Environment	
18	How would you rate your instructor's lectures? <ul style="list-style-type: none"> Excellent Very good Good Poor
19	How would you rate your understating of the subject after each lecture? <ul style="list-style-type: none"> Excellent Very good Good Poor
20	Does your instructor interact with students during his lecture? <ul style="list-style-type: none"> Always Sometimes Never
21	Does your instructor solve with you working examples during the lecture? <ul style="list-style-type: none"> Yes

	<ul style="list-style-type: none"> • No
22	<p>Does your instructor give you homework after each new topic?</p> <ul style="list-style-type: none"> • Yes • No
23	<p>Does your instructor penalize you for not doing your homework?</p> <ul style="list-style-type: none"> • Yes • No
24	<p>Does your instructor solve all homework with you?</p> <ul style="list-style-type: none"> • Yes • No
25	<p>How would you rate the benefits of your computer lab for this course?</p> <ul style="list-style-type: none"> • Very helpful • Helpful • Not helpful
26	<p>How often do you go to the computer's lab?</p> <ul style="list-style-type: none"> • 2 hours weekly • 4 hours weekly • More than 4 hours weekly
27	<p>Do you get any assistance from your lab's instructor?</p> <ul style="list-style-type: none"> • Always • Sometimes • Never
28	<p>Do you have access to the computer lab all the times?</p> <ul style="list-style-type: none"> • Yes • No
29	<p>Does your school have enough resources for this course in the library?</p> <ul style="list-style-type: none"> • Yes • No
30	<p>Do you feel that the learning environment is suitable and maintained properly?</p> <ul style="list-style-type: none"> • Yes • No

REFERENCES

- [1] C. Bereiter and E. Ng, "Three Levels of Goal Orientation in Learning," *Journal of the Learning Sciences*, Vol. 1, 1991, pp 243-271.
- [2] G. Evans and M. Simkin, "What Best Predicts Computer Proficiency," *Comm. ACM*, Vol. 32, 1989, pp 1322-1327.
- [3] D. Hagan and S. Markham, "Does it help to have some programming experience before beginning a computing degree program?" *Proceedings of ITiCSE 2000*, 2000, pp 25-28.
- [4] Ala-Mutka, K., "Problems in Learning and Teaching Programming", *Codewitz Needs Analysis: Institute of Software Systems*, Tampere University of Technology.
- [5] P. Byrne and G. Lyons, "The Effect of Student Attributes on Success in Programming," *Proceedings of ITiCSE 2001*, 2001, pp 49-52.
- [6] J. Davy and T. Jenkins, "Research-Led Innovation in Teaching and Learning Programming," *Proceedings of ITiCSE '99*, 1999, pp 5-8.
- [7] E. Dijkstra, "On the Cruelty of Really Teaching Computing Science," *Comm. ACM*, Vol.32, 1989, pp 1398-1404.
- [8] L. Mazlack, "Identifying Potential to Acquire Programming Skill," *Comm. ACM*, Vol. 23, 1980, pp 14-17.
- [9] D. N. Perkins, Schwartz S., and Simmons R. (1988) *Instructional Strategies for the Problems of Novice Programmers*. In R. E. Mayer (ed), "Teaching and Learning Computer Programming", pp 153-178, Lawrence Erlbaum Associates.
- [10] Cheng Wing Fat Johnny, (2010) "Teaching and Learning to Program: A Qualitative Study of Hong Kong Sub-Degree Students, University of Technology, Sydney.
- [11] McCracken, M., Almstrum, V., Diaz, D., Guzdial, M., Hagan, D., Kolikant, Y. B.-D., Laxer, C., Thomas, L., Utting, I., and Wilusz, T. (2001). "A multi-national, multi-institutional study of assessment of programming skills of first-year CS students." *SIGCSE Bull.*, 33(4), 125-180.
- [12] Bennedsen, J. & Caspersen, M. E. (2007), *Failure Rates in Introductory Programming*, *ACM SIGCSE Bulletin*, Volume 39 Issue 2, pp. 32-36.
- [13] Bruce, K. B. (2005), Controversy on how to teach CS 1: a discussion on the SIGCSE-members mailing list, *ACM SIGCSE Bulletin*, Volume 37 Issue 2, pp. 111-117.
- [14] Crawford, S. & Boese, E. (2006), *ActionScript: a gentle introduction to programming*, *Journal of Computing Sciences in Colleges*, Volume 21 Issue 3, pp. 156-168.
- [15] Eckerdal, A., McCartney, R., Moström, J. E., Ratcliffe, M. & Zander, C. (2006), *Can graduating students design software systems?*, *ACM SIGCSE Bulletin*, *Proceedings of the 37th SIGCSE technical symposium on Computer science education SIGCSE '06*, Volume 38 Issue 1, pp. 403-407.
- [16] Giangrande, E. (2007), *CS1 Programming Language Options*, *Journal of Computing Sciences in Colleges*, Volume 22 Issue 3, pp. 153-160.

- [17] Gross, P. & Powers, K. (2005), Evaluating assessments of novice programming environments, Proceedings of the 2005 international workshop on Computing education research ICER '05, pp. 99-110.
- [18] Hadjerrouit, S. (1998), Java as First Programming Language: A Critical Evaluation, ACM SIGCSE Bulletin, Volume 30 Issue 2, pp. 43-47
- [19] Hagan, D., Sheard, J. & Macdonald, I. (1997), Monitoring and evaluating a redesigned first year programming course, ACM SIGCSE Bulletin , Proceedings of the 2nd conference on Integrating technology into computer science education ITiCSE '97, Volume 29 Issue 3,, pp. 37-39.
- [20] Huet, I. Pacheco, O. R., Tavares, J. and Weir, G. (2004), New Challenges in Teaching Introductory Programming Courses: a Case Study, 34th ASEE/IEEE Frontiers in Education Conference (pp. T2H-5- T2H-9)
- [21] Lahtinen, E., Ala-Mutka, K. & Järvinen, H. (2005), A study of the difficulties of novice programmers, ACM SIGCSE Bulletin , Proceedings of the 10th annual SIGCSE conference on Innovation and technology in computer science education ITiCSE '05, Volume 37 Issue 3 pp. 14-18.
- [22] Lister, R., Berglund, A., Clear, T., Bergin, J., Garvin-Doxas, K., Hanks, B., Hitchner, L., Luxton-Reilly, A., Sanders, K., Schulte, C. & Whalley, J. L. (2006), Research perspectives on the objects-early debate, Annual Joint Conference Integrating Technology into Computer Science Education, Workinggroup reports on ITiCSE on Innovation and technology in computer science education pp. 146-165.
- [23] Powers, K., Gross, P., Cooper, S., McNally, M., Goldman, K. J., Proulx, V. & Carlisle, M. (2006), Tools for teaching introductory programming: what works?, ACM SIGCSE Bulletin , Proceedings of the 37th SIGCSE technical symposium on Computer science education SIGCSE '06, Volume 38 Issue 1pp. 560-561.
- [24] [http:// www.saudi.gov.sa/wps/portal/yesserRoot/home](http://www.saudi.gov.sa/wps/portal/yesserRoot/home).
- [25] http://en.wikipedia.org/wiki/Saudi_Arabia.
- [26] <http://ksu.edu.sa/en/>
- [27] <http://www.saudiarabco.com/en/home.html>
- [28] <http://www.sabic.com/corporate/en/>
- [29] http://www.kau.edu.sa/home_ENGLISH.aspx