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Gender differences in the use of computers, programming, and peer interactions in computer science classrooms

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Research shows that female and male students in undergraduate computer science programs view computer culture differently. Female students are interested more in the use of computers than in doing programming, whereas male students see computer science mainly as a programming activity. The overall purpose of our research was not to find new definitions for computer science culture but to see how male and female students see themselves involved in computer science practices, how they see computer science as a successful career, and what they like and dislike about current computer science practices. The study took place in a mid-sized university in Ontario. Sixteen students and two instructors were interviewed to get their views. We found that male and female views are different on computer use, programming, and the pattern of student interactions. Female and male students did not have any major issues in using computers. In computing programming, female students were not so involved in computing activities whereas male students were heavily involved. As for the opinions about successful computer science professionals, both female and male students emphasized hard working, detailed oriented approaches, and enjoying playing with computers. The myth of the geek as a typical profile of successful computer science students was not found to be true.

Keywords: computer science education; gender equity; computing preferences; social interactions in computing

Introduction

A great amount of research showed the disproportionate ratios of participation between male and female students in computer science programs (Adam, 2005; Farmer, 2008; Margolis & Fisher, 2003). One of the reasons for this disparity is students’ attitudes and opinions about computer science and their understanding of success in computer science programs. This under representation is also followed by a lack of confidence and underperforming of female students in computer science courses (Margolis &
Fisher, 2003). Blum, Frieze, Hazzan, and Dias (2007) emphasized that the influence of cultural and environmental conditions to computer education:

We posit and demonstrate that the notion of a gender divide in how men and women relate to computing, traditionally attributed to gender differences, is largely a result of cultural and environmental conditions. We illustrate that under specific cultural and environmental situations, women fit very well into CS [computer science]. Indeed, where cultural conditions allow for diversity, and where women are perceived as capable of doing computer science. (p. 110)

In this article, we will explore student preferences in participating in the discipline of computer science and computer science programs. More exactly, we explore and try to understand what students’ preferences in computing (in computer use, computer programming, and peer interaction) are and how do male and female students view successful computer science students. Further, we are interested to explore students’ views of the typical profile of successful computer science students. Moreover, we want to see whether computer science classrooms are identified as mere programming classes.

Our research questions are:

1. What are males’ and females’ preferences in computer science programs in computer use, computer programming, and social interactions in classrooms?
2. How do the students perceive the typical profile of successful computer science students?

The article is structured under six main sections. After the section Introduction, in the literature review, we will present how research presents computer culture from distinct perspectives of male and female students. In the next section, we will describe the methodology that had been used in this study. In the section The importance of computers for male and female students, we will present our findings for the first research question. In the section Opinions of successful computer science students, we will explain the findings for the second research question. In the concluding section, we will elaborate some final thoughts, the views of each gender about computer science programs and make some recommendations for computer science education.

Theoretical framework

Distinct ways of viewing computer science by male and female students

Differences of learning

Researchers questioned whether there is any evidence to support that females have greater logistical problems than males. DeClue (1997)
found that female students do not have different programming styles than males which impacts negatively on their performance in introductory computer science courses. However, DeClue claimed that computer science is perceived as hostile to female students. Also, the attribution phenomenon was revealed as working in favor of males and against females.

Boys prefer learning programming in a game format (Cooper & Weaver, 2003). In particular, they relied on hand–eye coordination, aggressiveness, and competition. Boys liked sound and special effects. They appreciated sports and violence as in wars. In contrast, girls preferred their IT programs to be learning tools avoiding sound or special effects. Girls communicated in words rather than in violent images.

Differences in course content

The possibilities of adapting undergraduate computer science curriculum to female students, by altering the course content, were explored by Shih (2001). The course selected was programming in Java in the School of Computer Science, Carnegie Mellon University. The alteration consisted of the insertion of analogies to facilitate understanding of the course content. Two groups of 21 students, with each having 11 females and 10 males, were selected for this experiment. The results showed that the use of analogies increased the interest of females for the course. Fewer females and a greater number of males wanted code examples. In the control group, majority of females had negative attitudes and they wanted more examples related to day-to-day life. In the experimental group, lack of analogies turned the attitude toward learning Java language from a positive to a negative trend. In the control group, using analogies helped female students to understand better and be more interested in the course. These changes affected more female students than male students (Shih, 2001). Although these results bring new attention to teaching methods, a considerable amount of research should be investigated in order to achieve more rigorous conclusions.

Different uses of computers between genders

Starting from widely inferred observation differences between males and females in their attitudes toward computers and their usage, Dickhauser and Stiensmeier-Pelster (2002) proposed a study to check whether gender differences in computer science were related to the large body of research on gender differences in mathematics and science. The researchers tested whether the model of achievement-related choices, a model initially designed for mathematics, could be used to explain gender differences in computers. The results showed that the values obtained did not vary as a
function of gender. Not only the experience but also the quality of achievement was important.

A “playing” attitude, if it is not viewed only as entertainment, increases greater flexibility in adapting to the new challenges (Venkatesh, 1999). This explains why so many boys who adopt playful styles finally feel fewer difficulties and become more confident than girls.

Wilson (2004) did a survey with more than 850 students to analyze the preferred ways of learning using computers. She noticed that females spent more time in assignments and e-mails, whereas males spent more time in surfing and games. As preferred assignments, women selected applications for applied fields (education, medicine, agriculture) while males selected applications in gaming. The lowest preference for both genders was mathematical applications. However, women were more interested in selecting mathematical applications than males. As a work style, individual work outperformed cooperative work without significant gender differences.

In another study, Rowell et al. (2003) found the following gender differences in comparing computer behaviors among high-school students: males have more interest in installing software and are more curious about how computers work. Females were more interested in intellectual activities and entertainment activities.

**Gender differences in views**

Many features that males and females view differently include selecting a computer science program, cooperation, competition, and anxiety. Bush (1996) investigated whether gender and group composition had any impact on the level of activity and cooperation. He found that students with low self-efficacy in computing and students in groups with a majority of females, cooperated more than any other categories in their work with computers. In terms of gender, the level of activity was high in female-majority or male-majority groups. Margolis and Fisher (2003) found that women “looked around and experienced their male peers knowing more and doing the work with greater ease. We found too many US women fall victims to the ‘computer gene theory’, even unconsciously” (p. 101).

For males and females, grades indicate to different extents whether students will pursue computer science as a major or not. A survey was conducted at St. Francis Xavier University, (CREW Project, 2001) a Catholic university in the USA. Among 942 students, roughly two-thirds were males and one-third were females. They were from 19 schools, taking courses in mathematics and advanced programming in computer science. From girls and boys with A and B grades in Mathematics and/or Computer Science, 48% of boys and only 17% of girls considered computer science as their major. This fact is of serious concern related to
the relevance of marks in computer science. If the marks are not significant in determining the future in majoring computer science then what could be a significant criteria? Asked if with more encouragement, students would select computer science major, only 3.2% females and 9.5% males answered “yes” and 21.5% females and 24.1% males answered “probably yes”.

**Linking computer science with other subjects**

At the beginning, mathematics was considered a mandatory requirement for students entering in computer sciences (Grundy, 1998). Consequently, because male students were having better performances in mathematics than females, many females were hindered in their effort to get into computer science. More recently, computer science was associated more with technology (Grundy, 2003), which is considered less interesting for female students than mathematics.

It was noticed that introductory courses in undergraduate computer science programs have a high rate of dropouts (Margolis & Fisher, 2003). For instance, Margolis and Fisher (2003) mentioned that the normal strategy is the “weed-out” formula, in which students are tested from the first year of study about their capacity to think in terms of algorithms. For this reason, many researchers tried to determine what should be the criteria to predict candidates for undergraduate programs in computer science. After the 1980s, the focus shifted to cognitive skills, computer skills (i.e. problem solving, critical thinking, and decision making), and attitudes toward computers (ISTE NETS Project, 2000).

**Methodology**

The study was conducted in a medium-size university in Ontario, with roughly 16,000 students. The Department of Computer Science had over 1000 students and around 40 instructors. Our study develops a collective case study for a convenience sample of 16 undergraduate students (10 males and 6 females), studying computer science either as a minor or a major, from the first year to the third year of study. Therefore, it is a qualitative study that uses naturalistic inquiry (Lincoln & Guba, 1985) to explore differences between female and male students’ views in the use of computers, computer programming, and the role of social interactions. According to Creswell (1998), case studies do not and should not necessarily be reduced to individuals. On the contrary, many such studies treat organizations and complex relationships as a composite or single unit.

The data collected was from observations in classrooms and laboratories, interviews, questionnaires, and documents. Two faculty instructors
answered the questionnaires. The selection of the participants took place at the end of each course, so that the sample of students consisted of participants who persisted until the final exam. The courses taken by those in the sample represent the main areas of preparation for computer science undergraduate students: algorithms, programming language, and web-design. Three courses were selected for the first year of study and they were mandatory for both major and minor programs. The next three courses were from the second year of study. Out of these three courses, two were mandatory for both minor and major programs, while the third was optional. For the third year, we selected a course required only for students who major in computer science. One author taught the first five courses and studied and practiced the skills required for the other two courses. Therefore, he was familiar with the content of the learning and teaching in undergraduate computer science courses that were selected in this research.

The importance of computers for male and female students

Students were aware of the increasing importance that computers are going to play in their day-to-day life. The importance of computers was viewed in much the same way for both genders as pervasive. For instance, Gillian was impressed by the high pace of IT advancement: “It is the science of computation using 0’s and 1’s . . .. The science of computer is constantly developing at an exponential rate. Who knows what computers will be like 20 years later, that’s what I’d like to find out”.

Asked why he likes computers, the vision of David was more related to engineering. He answered:

I like computers from a science engineering point of view. But I don’t like, you know . . .. Some people get obsessed. I am very interested because in computers it’s all electricity, it’s all engineering. So you do programming, hardware, software. It requires knowledge. It’s all pretty much science. You know, this is why I like computers, from that point of view. It’s so cute!

The role of computer use

It was noticed that the male and female students were advanced users of computers. Being students in computer science, all undergraduate students had adequately mastered user techniques. This was confirmed in observations in laboratories and in interviews and questionnaires. Students’ views were further confirmed by instructors. It was noticed that there were some differences between male and female students. The female students accepted the computers passively, using the computer possibilities as they were, without any complaints or possible suggestions to change. In contrast, the male students were very involved in connecting
the use of computers with programming. Eventually, they were actively involved in critically discussing the computers’ functionalities and proposing new options and facilities.

**Gender perspectives in programming**

There were very mixed views about programming in both genders. The majority of male subjects in this study enjoyed programming and also performed well in it while the females considered it to complete as a course requirement.

Asked about the role that programming represents for computer science students, a male instructor mentioned that: “initially they think of computer science as just programming”.

Describing programming, George had this to say: “I like programming because of the creativity involved. ... What I dislike in programming is the fact that it is sometimes time consuming”. Despite this, he confirmed that programming is what he enjoys the most. He was very interested in learning more object-oriented programming techniques. In addition, when he started to learn writing code, he also started to enjoy learning software design, UML, and software architectures.

Mike did not consider himself working in programming. In fact, he mentioned mostly courses related with hardware interfaces and tried to avoid courses that required programming skills. He mentioned that “the least interesting on computer science is coding” but appreciated that programming is very beneficial for people who practice it.

Remus also enjoyed programming in contrast to his previous job in electrical engineering, and he mentioned that in programming anyone can quickly achieve the results. Compared with his previous job, where he had to wait for the designed product for months, the results of his software activities can be seen instantly now:

I like the fact that I can see very quickly the result of my work. You know the steps you have to take and how is going to be. I don’t like to use the keyboard. [Laugher] But I have to do it.

Although the material was challenging for him, Remus was very attracted to do programming. He was much focused to surpass any obstacle that could interfere in accomplishing the required assessments and mentioned that learning programming is the only way to have solid foundations for a future career in computers:

I like the feeling after I have done something properly and it works. I put the equal sign between programming and computer science. You cannot do computer science without programming. Someone who is going to take computers should go deep inside with programming. It doesn’t matter the language.
As mentioned before, Remus had just started to learn programming. Although his schedule was very crowded, he was able to get A grades in programming courses. Moreover, he saw himself as being able to work in programming in the future and said he would be able to relocate with his family to anywhere where there is an opportunity for jobs in programming. He was very confident that computer science is equal to programming. He confirmed this again later but added: “at least it starts with programming”. His attitude helped him to improve his programming skills dramatically. At the beginning of the semester, he did not even know the basic rules, and how to use arrays or use the instructions for cycling (i.e. while and for). After these courses, he achieved the basic skills for C++ programming with an amazing speed and mentioned that this language, considered by experts as the most difficult one and avoided by almost all females (Margot & Fisher, 2003), is his main passion in computer programming.

Ravi liked programming because it is very important in computer science. He mentioned that:

I like programming because it tests your skills of computer science …. You can always try something different and new. The only draw back of programming is that if your basic concepts are not clear, your survival is very hard.

Female students also recognized the importance of programming. Gillian mentioned that she was very attracted to programming: “I like programming because it is a tool to create something that actually exists, and is real in a virtual environment. It allows your inner creativity and problem-solving skills to work together and develop something interesting”. Different from previous subjects, she mentioned that she enjoyed keyboarding and coding. However, she did not reduce computer science to programming. “No, programming is just a part of computer science. There is more to computer science than just lines of codes”.

Melody recognized the theoretical aspects of programming. “I like programming because it is very important. We cannot conceive actual society without programming”. Also, she acknowledged the failure of many IT teams: She said, “But sometimes it is very demanding and requires a lot of leadership and coordination with others, which is not accomplished in real situations”. Asked for pros and cons about programming, Lena mentioned: “I like programming because it gives me an opportunity to challenge myself but I do not like programming because it is very difficult and takes up all my time”.

Mainly, what was understood from female students’ attitudes was that they would accept programming tasks. They simply adopted a “must do” attitude but their target was not to remain in programming.
For Melody, her target was to work as an IT software analyst or an IT manager. Lena agreed with the importance of programming: “You need programming everywhere but it is not my greatest strength”. In fact, her experiences in both C++ and Java languages were unsuccessful. As a result she started to lose confidence and enthusiasm seriously.

Ramona was also interested in web-programming, but she says, “not something that take 100% of my time”. Because Ramona was very keen in web-design, she was interested to relate programming with web-design, where her graphical aptitudes would mix successfully with programming tasks. Sara perceived programming as a tough job but she mentioned “I like to do programming. I would insist on finishing the program spending as many hours as are required in order to finish the program”. Excepting two female students, all other females accorded an important place but only a theoretical approach to programming, a place in which they did not take a participative role.

Software preferences

Asked what software interested her the most, Melody answered: “I was working before as an assistant software analyst in a financial environment and remember its significance... For me, computer science is more software analysis and design”. As technical skills, female subjects considered themselves better in mathematics than male students. Also, females obtained good scores in web-design. Males considered themselves better in algorithms, C/C++ and Java programming. The greatest difference between males and females was in C/C++ language. It is no surprise, considering the fact that C language has a component considered to be a low-level programming language, related to assembler. Also, a great difference was noted in hardware concepts, males being more interested in details related to how computers work.

As Remus mentioned: “Something that was never built; something to take from scratch”. Ravi answered “UNIX programming, it’s interesting”. David was quite advanced. His high expertise in the IT field in programming and administration made him see a unity between hardware and software. His projects were also related to this combination. First, he wanted to design computer games:

I have a lot of projects in my mind. I don’t have enough time to do all of them but here are a couple of them. One of them is I’m thinking of designing a game. But it’s not something new about technology itself. It’s about story, how it’s implemented differently. I look at games, big companies, how they are doing. It’s very nice how they are doing, but it’s more that they can do from that point.
Second, he mentioned that he is intended to create “virtual desktops”.

Something important about current trends in computer science industry that were not covered by the current undergraduate curriculum was Visual C++, C#, .Net, Rational Rose, etc. Although these programs are frequently requested in IT industry, female students were not willing to learn these products by themselves. This tendency was different for male students. Almost all male students, not only those who were considering themselves successful, already started to track a software product and consider its future impact.

The role played by experience

The questions about experiences were related to many observations and findings that could not be compressed in an occasional paragraph. In fact, the following finding is one of the most important ones in current research. Students from both genders were aware that employees will be expected to have practical skills for the possibility to work in real projects. Employers were less willing to wait a couple of months until their new IT employees would be able to acquire the needed technology and the employers were reluctant to spend extra money for training. Students knew that the employers wanted the results right away and that practice and experience were the most important ones while the academic record had little or no importance.

However, male and female students behave differently. Keeping in mind this aspect, the majority of male students mentioned an interest for real practice and less for academic record. As was mentioned before, among male students, only those interested in pursuing graduate studies were working to achieve good marks. Many of the male subjects were just waiting to finish the program.

Female students were also aware that in the absence of practical experience, their academic record was of almost no importance. Many seemed resigned to the fact that their grades would not get them jobs in the IT industry. Missing useful contacts in order to help them work in real-world projects, it was noticed that female students did not even try to practice beyond the academic requirements. This fact was an expression of anxiousness that female students face. The failure to prove that they have real practical experience did cause them great lack of confidence. This was often mentioned by researchers when comparing gender achievements in computer science (Margolis & Fisher, 2003; Sanders, 2005).

The role of mathematics

Old paradigms often related to the successful skills in computer science with high aptitudes in mathematics (Grundy, 1998). In fact, out of all
required courses, only the first course, key concepts, was very connected with mathematics. With the exception of this course, a strong background in mathematics was not required in the general bachelor of computer science course. However, students who wanted to pursue a bachelor with honors were required to pursue additional courses requiring high skills in mathematics. In addition, some courses required for the undergraduate program had topics in pure mathematics.

Few of the subjects considered mathematics as crucial to success in computer science. Of the male subjects, Ali felt that mathematics has a very important role and more courses with mathematical background should be included although this is not what his colleagues want. Mike considered the essential role that mathematics plays in computer science but he did not have good mathematics skills. He said, “Good understanding of math . . . I do not have such skills”.

Least preferred activities

Females were least interested in “pure programming”. In consequence, C++ language was not their preference. For instance, as we mentioned before, although Melody took three courses to master the C++ language, she mentioned that this language was her least favorite. Asked what interests her least about computer science she answered “programming. Although it is important, I do not consider myself doing programming activities for a long period of time”.

Interestingly, Gillian and a female instructor gave almost exactly the same answer about what interests them. A female instructor mentioned, “The history of how things were developed least interests me”. Similarly, Gillian mentioned that her least interest was to look at the history of computer science, or to study what has been done in the past.

For some of the male students this question was difficult because they mentioned that they like all computer science courses. Male students who remained in programming avoided tasks in network administration. Also David, Lee, and Ravi did not have the required time or patience to understand the relations between theoretical concepts (grammars, automata, etc.) and software applications that they use on a day-to-day basis. Another student, who anticipated his future in computers’ business world rather than in computer programming, mentioned that debugging is the least preferred activity.

The role of social interactions in computer science

The traditional approach of individual programming is no longer valid and there is a greater focus on team programming in the IT industry today. The increasing number of demands has increased the complexity of
software. The new products cannot rely only on few perfectionists acting independently. As a result, the number of IT professionals on a software project team has increased.

For this reason, social interaction has started to be prized more than individual technical skills. The mainstream of professionals has moved ahead, accordingly with a scant admiration for someone who is capable of finding leaks in software packages but probably will not be able to be on a software team. Both male and female students valued social interactions and software design more than hacking as favorite tricks.

The importance of social skills

During the 1990s, the IT work market showed that the idea of focusing narrowly on mathematics or computer skills is not worth. Sometimes, gifted technical people could not adapt themselves in a team because their social skills are not at the same level with their technical potential. For this reason, employers started to consider and assess social skills seriously. This caused a shift in students’ attitudes toward being more aware of the importance of teamwork.

The respondents in this study identified this aspect as being very important. Ali mentioned, “social skills, I think, are very important nowadays. You might be the most intelligent person in the world but if you don’t conduct yourself in a social gathering you gonna have a hard time”. This observation was in contradiction with what former researchers noticed in the previous decade that males were individualistic and females were more social. Ravi mentioned, “it was programming, now it’s more contacts”. Asked what is important when he is part of a team, Robert answered: “the people involved. I want to work with smart people so I don’t have to carry all the weight”. The female instructor confirmed the importance of social skills: “Students must learn to be team-players. It is an important trait that employers are looking for in their potential employees. Female students usually take more passive roles”.

Thoughts about careers in computer science

When asked about experience in IT jobs, males and females provided different answers. Asked about their experience about having a career in computer science, the majority of female subjects did not have a clear image. They had no experience in the IT job market. They had very little information about real IT jobs. This could be identified as another reason for the failure of female students in computer science. At best, they saw programming as inevitable, but a boring job, at least at the beginning of a career. As was mentioned before, they tried to avoid programming. Also,
they were not concerned with finding the real aspects of the job in order to learn different situations. The male instructor mentioned that female students were “better at social skills, in computer science they are more likely to succeed as IT managers than (often socially isolated) programmers”.

During the classes, one researcher met a female student who was in a biotechnology program as a major and computer science as a minor. There was an informal discussion about jobs. She knew nothing about IT jobs but also nothing about her future career in biotechnology. This situation was valid for many female students. Except Gillian, all the other subjects were not aware about their future job. They did not have a clear idea about IT careers.

The male attitude toward a career was different as several students had worked as professional IT careers. In general, students who considered themselves fit for computer science were sensitive of the requirements of an IT job.

Opinions of successful computer science students

Link with other subject areas

In contrast to the decades of pioneering in computing, when working in computer science was related more to mathematics (Grundy, 1998), the last decade in particular saw computer science more linked with engineering than any other domain. Computer science was viewed as a technology and the IT worker was consequently seen as an engineer. The majority of male subjects in this study saw computer science as being more closely related to engineering. David and Ravi mentioned engineering as a potential career. Remus had an engineering degree and 10 years experience in this field. He mentioned proclivity to use computer as a tool: “You have to be very computer oriented. It’s not enough to be good in logic and mathematics. You have to like to stay in front of computers in order to understand”.

Female participants also recognized the similitude between computer science and engineering. Ramona mentioned a link between these two areas. Melody was also attracted to engineering before. In fact, as an assistant analyst, she had many tasks in the administration of computers. Her engineering skills helped her cope with the requirements. In administrational tasks, she was the most skilled of the female subjects.

As Grundy (1998) mentioned, designing a program that will process some data, finally will produce an impact on physical devices. It is more obvious that during the last decades, when microcomputers started to be widespread, computer science started to be more associated with technology than with mathematics. All in all, the link between computer science and engineering attract males in a greater measure than females.
Importance of hardworking

Students were aware that computer science is a very dynamic domain which requires frequent updates. Both genders mentioned that many additional hours are necessary in order to cope up with the novelties. They were committed to study computers as a full-time job. All female subjects were studying computers at least 40 h per week. Male students recorded strong differences. Some of them mentioned that they worked “all-day”. Other male students mentioned that they do not work at all after classes. None of the subjects viewed programming ability as an “innate” trait. They all felt that success could be achieved through hard-work. Male students in particular felt that hard-work was the only recipe for success.

Abdul mentioned: “Hard work and very good aptitude. Yes, I fit that mostly”. George suggested that the ideal student was someone who “works hard with patience” and that he was such a student. Ravi mentioned “Well, they tend to be very hard working, so I miss out ...”. A common characteristic of both genders was that hardworking is a “should have” characteristic, for computer science students to be successful.

All subjects were well aware that computer science requires a sustained effort to update their knowledge. Sometimes, this was mentioned as a bonus as well as a disadvantage for computer science. Ravi mentioned “If you don’t update yourself in computer science, you are out of the market”. Gillian mentioned her enthusiasm for the high pace of change in computers. This is why she liked computer science. One female student claimed that she had to sacrifice extra-time for the frequent changes in computer science. Ramona mentioned that fast update of the content in computer science could be difficult for a female who has a family.

Female attitudes about computer science

Questioned about the picture of the ideal student in computer science, some students perceived this area as traditionally male. The close links between computer science, engineering, and mathematics greatly influence this perception among the majority of male subjects but also among some female subjects. For example, David mentioned that because of strong requirements in logic, mathematics, and technology “there are very few girls in computer science”. Robert explained the difference in the following way:

Because it’s traditionally a male oriented job, and people, whether they like it or not, are conditioned to do things that fit into traditional roles. That’s why I’d never take nursing, even though in reality it’s a perfectly good profession. These things are changing, but slowly.
Two female students mentioned that from early childhood they viewed computer science as “boys’ expertise”. One of them mentioned that “women are not interested in selecting a major in computer science”. Not all students had the same opinion. Some of them believed that gender is not an issue to perform well in computers. One of the students from South Asia mentioned that her culture tries to encourage both females and males. Remus suggested that females do not need to further prove their competence. So he rejected any negative female stereotypes saying, “Some of them I realize are doing very well so it is not something related with gender. Some of them are not”.

The old myth of the geek is irrelevant but still persistent

A major characteristic of computer use in the 1980s and 1990s was the fascination of people around hacking (Kersteen, Linn, Clancey, & Hardycyk, 1988; Margolis & Fisher, 2003). But this trend was not followed for the next decade. However, this was the impression that the mass-media had created in its hunt for sensational news.

The image of the geek attitude persisted in some of images provided by subjects. Ravi mentioned that the successful students from computer science are “Dry humor and bookworms . . . No, I do not fit in this”. Lee gave a hilarious thought: “I would think a typical computer science student would be skinny, wears thick black glasses, very shy, and talks about computers all day long. I do not think I have these characteristics”. However, he was skinny, was often wearing black glasses, was pretty shy in class, and stayed in the first row, always frequenting the Java classes and paying complete attention to lessons. In fact, his image about hacking was from futurist movies about computers and technology. It should be noted also, that for Lee and Ravi, the successful computer science student had some characteristics of geeks and hackers.

Generally, the image of “geek” and “hacker” was not found to have so much importance. Hacking was not perceived as important anymore because finding bugs could be jobs for testers, not for experienced people in computer science. In any event, this is something of only minor importance. However, exploiting a bug for the purpose of deception is a felony punishable by jail time or fines. There are tough laws implemented in order to combat computer frauds. For this reason, the mass-media does not propose this kind of image in movies anymore. The shift from hacking to “social programming” was confirmed again by this study.

From the stand point of the current research, the stereotype of the “geek” is an outdated picture of the ideal IT specialist. It came from people who were far removed from IT specialty. Robert mentioned that there are not many “geeks” around anymore: “The stereotypical computer science student is portrayed as an introverted ‘geek’ who sits
at his computer all day. While I’ve run into some of these people, it’s not really the case with most of the people I associate with”.

In observing all the seven courses, we have noticed only one student who could be labeled as a “geek”. He participated regularly in lectures and laboratories but never asked a question. He was excellent in laboratories; an assignment that took him more than 30 min was something very rare. Other students identified him as an excellent technologist and his status was established as he was already working for an IT company. However, he was not easily sociable. He worked alone all the time and did not collaborate or cooperate with others.

Concluding statements
An important observation for the research question which explored the perceptions of male and female students about computer science in three fundamental aspects – using computers, programming, and social interactions – was the lack of focus on “narrow hacking”. This occurrence of the “end of epoch” fascination toward hacking was revealed again in the interviews with undergraduate computer science students. The theoretical representation of computer science resulted in similar answers for males and females. However, there were differences in the role of programming, Internet, and game playing represented by gender.

In the computer use, female and male students performed apparently with similar performances. If we look more detailed, male students used to connect programming, design, and use them together while female subjects accepted de facto standards of computers.

Male participants had greater confidence and less anxiety in using computers and programming than female subjects. Female participants in this study were interested more in web-design, web-programming, and databases. Male students had a very complex palette of interests: hardware, networks, OOP languages (C++, Java, .NET), web-programming, web-design, games, and software design. Overall, female students were less interested in programming than male students.

Female students were less self-directed and less willing to find detailed information about current IT market. Both genders were aware of the importance of social and managerial skills involved in this discipline. Male students built an active interest toward having a social career while females remained passive and were oriented to perform well in classroom.

Successful students were viewed as having enjoyment with using computer technology. They were observed as fast, self-directed learners. Also, the importance of hardworking was mentioned as very important. Somewhat new, the subjects from our study did not confirm the vision of the old myth of the geek as previously mentioned in Margolis and Fisher (2002).
With regard to the role that programming plays in computer science, researchers often mentioned that males outperform females in programming (Cooper & Weaver, 2003; Margolis & Fisher, 2003; Pickett, 2005). Our research confirmed this result.

The greatest difference of opinion between males and females about computer languages was the C/C++ language. It is no surprise, considering the fact that C language has a component considered to be a low-level programming language, related to assembler. Margolis and Fischer (2003) found similar observations in their study where mastering C++ language was considered for experts not for “Java wimps”.

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