

Promoting Computer Science programmes to potential students: 10 Myths for Computer Science

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During the last decade, our involvement with discussing with potential students and their parents before they apply for an undergraduate Computer Science programme, made us realise that there exist patterns in people's minds about Computer Science studies and profession. These patterns form misconceptions, which we identified as myths. In this paper, we present ten of them. We argue that these could be used as a promotion tool to attract potential students. Bearing in mind that Computer Science programmes all over the world have suffered a decrease in admissions, we believe that a good marketing policy that will lift public misconceptions about Computer Science will contribute to attracting more students to the discipline.

Keywords

Computer Science Education, Admissions, Promotion & Marketing CS programmes

1. Introduction

Admittedly, admissions in Computer Science (CS) or related programmes in Higher Education (HE) have dropped significantly over the last five years all over the world [1,2]. Although there has been considerable investigation for the reasons that lead to this decrease [3,4], and some of the results reported are intuitive, it is not always justifiable why potential HE students do not have CS anymore among their first choices.

There is a number of corrective actions that Universities and in particular CS Departments took or are planning to take in order to restore the popularity of their CS programmes [5,6]. Briefly, some of them are:

- Update the curricula by change of titles and content, so that prospective students identify (buzz-) words that look trendy;
- Enhance the curricula with courses that focus on industrial applications and business;
- Change the mode of delivery to make CS courses more fun to students and integrate ICT more into teaching and learning;
- Abolish or minimise as far as possible theoretical courses, while dressing them up with a more attractive wrapper;
- Apply their influence on secondary education teachers who might inform and guide their students;
- Introduce mutated programmes that include many elements from business studies, entrepreneurship and innovation;
- Promote and advertise programmes separately from others;
- Upgrading their web site promotion by presenting up-to-date staff and student achievements (research and industrial), figures of graduate recruitment, etc.

However, the above actions, although looked intuitive from the business side of view, were not always well received by academic staff.

In our Department at CITY College, Thessaloniki, we also took a number of actions similar to the ones listed above. As a result, some seem to work, some others do not, without, however, having gathered long-term data to qualify and justify the results. In addition to this, we are currently considering another way of promoting our programme with the objective to change the potential students' perception for CS. This approach is based on a number of misconceptions that secondary education students have about a CS programme and a CS professional. The aim is to list 10 myths for CS, argue against these and if possible convince the public to drop these misconceptions, which at large, constitute a preventing factor to follow such a programme, choosing what is perceived as "the easier way to graduate", for instance non-engineering programmes.

In this paper, we present these 10 myths for CS studies and profession in Section 2. Our intention is to initiate debate on these among fellow colleagues and finalise the list by strengthening our counter arguments. In section 3, we discuss our graduate students' perception on these in order to informally validate our approach. Finally, we discuss our Departmental promotion policy, which includes these misconceptions of the public, with the aim to attract more students to the discipline.

2. Ten Myths for Computer Science

Since the first cohort of Computer Science students in our Department, 15 years ago, we have been interviewing each one of the potential applicants. In Greece, it is common that no student applies for a programme in a private institution before they talk to the College administration and academic staff, requesting information on all aspects of education provision and career development. Although this may not be common for the rest of Europe, most of the times, candidates are accompanied by other family members, usually parents, who also participate in the discussion around the programme of study. Such meetings last between 30 and 60 minutes and are extremely important for both parties. For us, it is a perfect opportunity to find out what people think about the College and its programmes, and in the current context and culture, what people think specifically about Computer Science.

So far, we met multiple hundreds of cases, perhaps few thousands. At first, it was sometimes surprising to listen to people's opinions about Computer Science. The recurrent cases over the years made us suspicious that there might exist patterns in the public perception about CS. Our accumulated experience helped us in addressing in personal discussions some wrong impressions candidates and their parents have. Lately, we decided to form a list of such misconceptions and call them "*myths about CS*". We managed to compile a list of ten such myths (Table 1) and a set of counterarguments to use in interviews with potential candidates.

In the following, we present the myths and a brief analysis. Each one is accompanied by a counterargument as it is presented in our leaflets. Note that the wording and the analogies used in our promotion materials and brochures may sometimes look simplistic or even naïve or provocative but remember that these are just a marketing tool to address the public's misconceptions and help us carry out discussions with the average potential students and their parents.

Table 1 The Ten Myths about Computer Science in brief

#	Myth
1	Computer Science is sending emails, browsing the Internet, word processing and learning to use specific application programs
2	Computer Science is programming
3	Computer Science is maths, maths ... maths!
4	Computer Science undergraduate studies restrict the choice for postgraduate studies
5	Computer Science jobs are boring, lonely and are all taken
6	Computer Science graduates never reach higher management positions
7	Computer Science studies is only for men
8	Computer Science, Information Systems, Computer Engineering, Computing ... are all the same
9	Computer Science is not as important to society and business world as other disciplines
10	Computer Science is for "nerds/geeks"!

1 Computer Science is sending emails, browsing the Internet, word processing and learning to use specific application programs.

Lots of candidates ignore what CS is. Their encounter with computers is limited in secondary education and restricted to use of applications for word processing but mainly the Internet. If they are lucky they can get some good outline in the career development seminars among all other disciplines. Parents are in much worst situation. They keep on asking whether, as graduates, their children will *"have equal career opportunities to those having acquired ECDL"* or similar certification. Others, say that their children *"do not need CS because they were into computers every day since they were five years old"*, obviously meaning the encounter with email, games and chats on everyday basis.

We state in our promotion material: *"Anyone can do this! None needs to enter a HE programme in Computer Science in order to perform such tasks. In a similar way that none needs a HE degree in Mechanical Engineering or Electronics to drive their cars or use their TV sets. However, Computer Science is targeted towards developing such software, services and applications solutions so that other people can use them"*.

2 Computer Science is programming.

This comes from potential students rather than parents and it is the famous narrow view about CS. Potential applicants ask a lot of questions about programming languages, how many they are going to learn, in what depth etc. They are surprised by the fact that the number is much less than expected, because they cannot imagine what else they can do through the three years of study. Occasionally, a similar misconception is brought up, but this time with respect to hardware, that is, *"CS is about fixing PCs when they break"*. Especially, parents would love to see their kids fixing something, because most of them cannot understand programming.

We state in our promotion material: *"Again, most people can do this with a bit of reading and practice! Programming is a technical skill for which someone does not need a degree to acquire. Should you be an engineer to fix a leaking water pipe in your place? Someone with an engineering degree knows everything about materials and hydraulics including perhaps hands-on practice with tools. Programming is just a tool for Computer Scientists. Current complex software systems require software engineering methods, methodologies and approaches"*.

3 Computer Science is maths, maths ... maths!

There are two categories. The usual math-phobic question: *"Is maths involved? Can I make it with the maths I know so far?"* and the math-alibi statement: *"I am not good in maths and therefore I am not interested"*. Both come as a result of inadequate knowledge of what maths is and what is good for. In high school and lyceum, students did, admittedly, a lot of maths, without however being able, or have time, to appreciate it. In an intensive examination system, teachers prefer to get students going with maths rather than engaging on philosophical discussions.

We state in our promotion material: *"Not really! Maths in a Computer Science programme is specific to this discipline and is taught almost from point zero. It is not just maths for maths. Yes, we do need maths, because we are required to establish correctness and soundness of the applications developed. This is much alike the way that mathematics guarantees that a newly designed airplane is safe to fly without killing people before we spend millions in constructing it. Maths is what makes it a Science!"*.

4 Computer Science undergraduate studies restrict the choice for postgraduate studies.

People get the wrong impression that the only postgraduate studies they can pursue are those relevant to Computer Science, with emphasis in one of CS areas, such as networking, software engineering, artificial intelligence etc. They seem surprised to hear that the horizons for postgraduate studies are wide open to other programmes from different disciplines. Some, they have not even thought of such possibility and although they do not believe it, they look happy from such prospect.

We state in our promotion material: *"To the contrary, a CS degree opens a wide range of potential! Actually, it is evident that graduates who follow Master's degrees in other, even unrelated, disciplines like Management, Music, Politics etc. are extremely successful because they possess the fundamental intellectual skills and long-life learning abilities that help them towards such an attempted conversion"*.

5 Computer Science jobs are boring, lonely and are all taken.

Boring comes together with lonely as a result of a stereotype developed in people's perception about a person who spends most of its day and night time in front of a PC. The idea that all jobs are taken comes from the general impression about unemployment figures. CS related job offers, although from time to time affected by the general socio-economic trends, are still and will be in abundance. It is not always easy to convince parents when discussion comes to careers and employability, but few good examples of graduates' successful career path could ease their concerns.

We state in our promotion material: *"New problems and new needs by the society and the industry never leave space for boredom because new solutions must be devised and offered. The complexity of the problems addressed is such that none can manage alone. Computer Scientists more than any other related discipline need to work in well-structured teams. The need is increasing because demands for automated solutions are increasing. During the last decade, Computer Scientists are highly employed. The demand is still constantly high. With the current trends of the market, it is predicted that Computer Scientists would be hard to find"*.

6 Computer Science graduates never reach higher management positions.

Again the stereotype of a “hard working developer wearing t-shirt and jeans” is the source of this myth. In people’s mind, CS professionals are there to be instructed what to do from top level tie-dressed managers, without arguing much, they work at a dark room with PCs and junk food all over the place because there is nothing else they are able to do. However, there is plethora of examples of Computer Scientists and Engineers in general, who make high management positions due to their skills and pragmatic approach to businesses. This is also supported by the fact that no small proportion who choose to do an MBA at their late thirties, are top executives in their companies with a CS or engineering background.

We state in our promotion material: “Computer Scientists acquire such organisational and communication skills that are highly suited for high management positions. The disciplined ways in which they face problems and engineer solutions make them able to undertake and successfully cope with many managerial tasks. In addition, IT has become so important for businesses that Computer Scientists are directly involved in decision making for the future development of businesses”.

7 Computer Science is only for men.

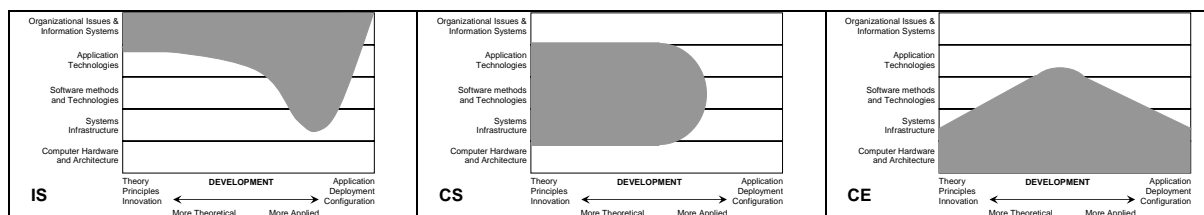
While CS always attracted more men than women, the last ten years the gender gap is expanding [1] and fewer young women are entering the discipline every year. The fact that CS does not seem to appeal to young women originates from the distorted image of the computing career and the misconceptions that programming is a solitary activity and that jobs are boring and lonely. Young women believe that they will be alone inside a room writing code all day long or talk to others with acronyms; they simply can not imagine themselves doing these and inevitably become a “geek”. Furthermore, although women are creative and innovative by nature, they have the misconception that CS does not require such skills and as a result they do not pursue a career in this area.

We state in our promotion material: “It is true that men have outnumbered women in computer science in the past, but this is changing. Increasingly, women are becoming extremely successful professionals. On average they might even do better than men! Computer Science is about helping others solve problems, learning about new ideas, face challenges, dreaming up new situations, products, and ideas. Contemporary women contribute to all the above in an innovative way”.

8 Computer Science, Information Systems, Computer Engineering, Computing are all the same.

There is a tendency to confuse these. Especially in countries where “Computer Science” and “Informatics” basically mean the same thing, while “Science” and “Engineering” are used as synonyms. The ACM/IEEE CS Curricula [7] helped a lot in trying to differentiate these with the figures provided in table 2 below.

Table 2 Differentiation between Computing Programmes [7]



We state in our promotion material: *“Computer science spans a wide range, from its theoretical and algorithmic foundations to cutting-edge developments in robotics, computer vision, intelligent systems, bioinformatics, and other exciting areas. Information systems focus on integrating information technology solutions and business processes to meet the information needs of businesses and other enterprises, enabling them to achieve their objectives in an effective and efficient way. Computer engineering is concerned with the design and construction of computers and computer-based systems. Although they may share common grounds, all three are distinct from each other”.*

9 Computer Science is not as important to society and business world as other disciplines.

While the number of occurrences that this specific misconception was revealed during interviews has decreased during the last three years, it still does exist. The primary reason that contributes to the formation of this misconception is the belief that CS is concerned with sending emails, browsing the Internet, word processing etc. As a result, candidates and parents who lack understanding of the area justly fail to see the importance of the discipline since they can not realize how the use of such application programs improves quality of life.

We state in our promotion material: *“Are the following important for the society and business world? Safe driving and flying? Privacy in communications? Correctness and integrity of sensitive business and personal data? Safety of bank accounts, anytime-anywhere access and management of knowledge? Reduction of cost in business operations? Effective health services? If so, then Computer Science is at least as important to society and businesses as other disciplines”.*

10 Computer Science is for “nerds/geeks”!

Mostly used in secondary education, the stereotype of a “nerd/geek” refers to a student who is highly competent especially in traditionally difficult courses such as mathematics and physics. As a result, anyone who believes that CS is about mathematics and algorithms assumes that only such students can attend and succeed in computing courses. In addition, the stereotype of a “nerd/geek” is presented in many movies as someone who is awkward, without any social life and with friendships limited to other “nerds/geeks”. As a result, other students may be strongly discouraged to attend a discipline in which they will have no ‘fun’.

We state in our promotion material: *“This is a distorted image that Hollywood films impose to the general public. Computer Scientists seem to talk to each other with some undecipherable technology terms but this is no different from what Doctors or Engineers or Lawyers or Philosophers do. Computer Scientists are trained to acquire good communication skills and general knowledge that will help them to interact with people for whom they provide solutions”.*

Interestingly enough, the vast majority of the people met with staff were not concerned with research at all. This is somewhat disappointing for academic staff that spend considerable amount of time in conducting research with, among others, the aim to enrich teaching and learning with up-to-date developments. It is something that the public ignores its importance or at least it seems that it is not one of the first priorities in choosing CS programmes.

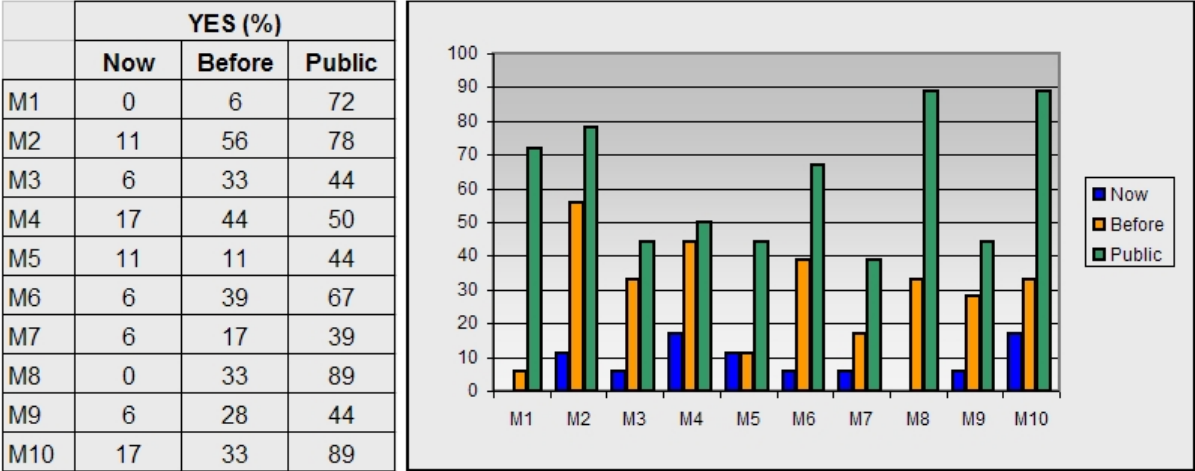
3. The perception of final year CS students

As said above, there is strong evidence that these myths do exist, as thousands of discussions held over the last decade with potential candidates and their parents revealed.

We thought of asking final year students about what they think about these myths. This is by no means a way to validate the myths stated in this paper. However, we thought that by asking our students what they believed before they started their studies and what when they are about to graduate, we can demonstrate that some (or all) of these myths do exist.

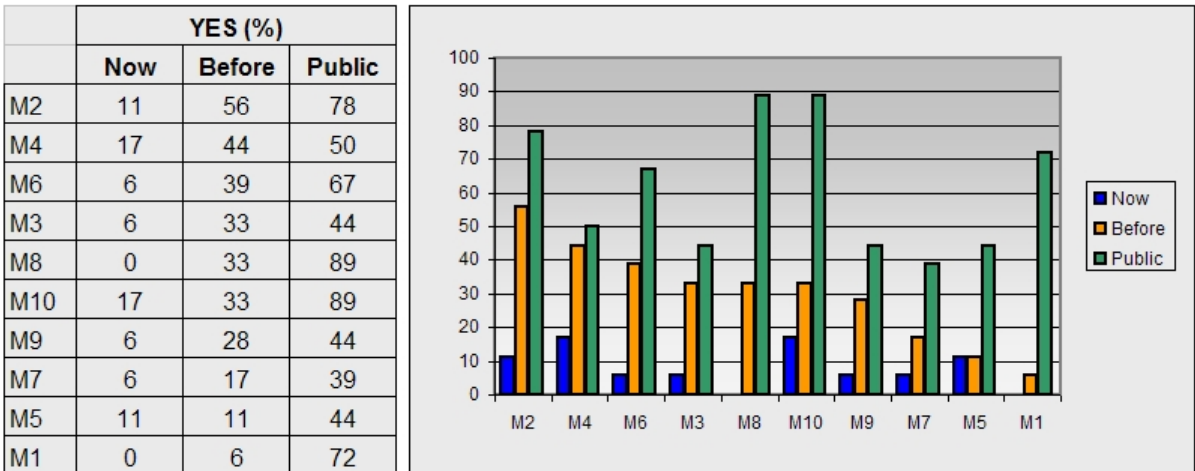
We conducted a short survey on our final year undergraduates by distributing a questionnaire with these 10 myths and asking them to express their beliefs in order to consolidate our suggestions. Furthermore, we also thought that it would be interesting to see their opinion (view) as to what current high school seniors believe about the 10 myths. Twenty (20) students completed the questionnaire the results of which are presented in figure 1 below.

Figure 1 Questionnaire Results



In the above figure, the first column of the table and the first bar of graph represent the percentage of the students that agree with the 10 myths just before graduation whereas the second column and the second bar denotes the percentage of the students' who agreed with each myth before they started their studies. The third column and the third bar depict what the students think that current high school seniors think. Figure 2 below presents the same results but sorted by popularity of the myths before our senior students started their studies.

Figure 2 Questionnaire Results Sorted by popularity of Myths



While the results of the questionnaire are simple to understand, a few key indications are the following:

- our students did have some misconceptions regarding the CS field before they started their studies but after three years almost all myths were significantly dropped
- the second myth was the strongest one and 56% of our final year students thought that 'CS is about programming' before they started their studies
- a high percentage of the students believe that current high school seniors have the wrong perception about the field of computer science and the CS profession with myths 10, 8, 2 and 1 being the strongest ones
- unfortunately, it seems that students still believe that CS jobs are boring, lonely and are all taken. This is expected from students that have not yet entered the marketplace but also, that perhaps the market itself gives such an impression to potential employees.

We also conducted the McNemar test for each of the ten myths in order to see the actual significance of change in the views of the students. The McNemar test compares paired samples and tests the significance of their difference. The results revealed that there is a significant change in the number of students who changed their perception before and after their studies for myths 2, 3, 6 and 8 with significance levels p 0.021, 0.031, 0.031, 0.031 respectively.

4. Conclusions

During the last five years, the Computer Science discipline is facing a crisis mainly due to the great decline in student enrollment. Having acknowledged this problem computer scientists and computer science educators conduct investigations in order to pinpoint the reasons that CS is not appealing to students any more and to propose solutions that will restore the popularity of the field. According to these investigations, one of the major sources of the problem is that prospective students and the public in general have a distorted view about the discipline itself, what a computer professional does and a computing career in general. After fifteen years of interviews with potential applicants of our undergraduate CS programme and their parents, we were able to determine a number of misconceptions that exist. In this paper we present these misconceptions as myths about CS studies and profession. Our intention is not to present a finalised list of prevailing misconceptions but to launch a discussion on these myths among fellow colleagues in order to strengthen our arguments. We believe that this approach can facilitate the marketing plans of CS departments that would like to promote their programmes to potential students. As part of our promotion of our undergraduate CS programme, we have created a leaflet entitled "10 Myths about Computer Science". This leaflet presents and then drops these misconceptions. The leaflet is disseminated along with the other promotional material, such as examples of our graduates who today have a lot of success in different fields and countries, such as e-learning, security, telecommunications, etc., to anyone who seeks information about the specific programme of study. We have also written articles in local newspapers and finally we are planning to develop a web version of the myths which will be added to the department's web site.

References

- 1 Vegso, J. Interest in CS as a Major Drops Among Incoming Freshmen. Computing Research News 17, 3 (May 2005); www.cra.org/CRN/articles/may05/vegso.

- 2 Foster, A. Student interest in computer science plummets. *Chronicle of Higher Education* 51, 38 (May 27, 2005), A31.
- 3 McGettrick, A., Boyle, R., Ibbett, R., Lloyd, J., Lovegrove, G., Mander, K. *Grand Challenges in Computing Education*. BCS, 2004, ISBN 1-902505-63-8
- 4 Patterson, D. Restoring the popularity of computer science. *Commun. ACM* 48, 9 (Sept. 2005), 25–28.
- 5 Denning, P., McGettrick, A. Recentering Computer Science. *Commun. ACM* 48, 11 (Nov. 2005), 15–19.
- 6 Klawe, M., Shneiderman, B., Crisis and Opportunity in Computer Science. *Commun. ACM* 48, 11 (Nov. 2005), 15–19.
- 7 Computing Curricula 2005. ACM, IEEE-CS, AIS. http://www.computer.org/portal/cms_docs_ieeeecs/ieeeecs/education/cc2001/CC2005-March06Final.pdf