KJC4 4CREDITS

FINAL PROJECT

WOMEN IN COMPUTING/COMPUTER SCIENCE

INTRODUCTION

This annotated bibliography provides a summary of literature pertaining to the topic in order to gain an understanding of the current situation of women in the field of computer science. It has also been discovered that in most countries, there are very low percentages of women in the information technology sector. These articles provide possible explanations for this occurrence, broaden our understanding of the challenges women have faced and are still facing in the field, describe strategies that have been implemented to boost female representation in the field , examine what effect gender has on choosing a career in computer science and discuss why some women chose to have careers in the field of computer science.

Google for Education(2014). Women Who Chose Computer science- What Really Matters. Available at <https://static.googleusercontent.com/media/edu.google.com/en//pdfs/women-who-choose-what-really.pdf>

According to studies, female participation in Science, Technology, Engineering and Mathematics(STEM) has reached an all time low in recent years , dropping form a peak of 37% in the mid-1980s to a startling 17% in the present day. This has not helped the already evident shortage of skilled personnel in the workplace. Google is a proponent of the belief system that a more diverse workplace leads to better products that can cater to a diverse population. They also believe that this study will help create actionable insights that can be implemented to reverse the negative trend. Their study involved the traditional exploration method where they searched though previous literature on the topic to identify possible factors and what techniques been implemented in the past to solve this issue. They were able to identify 91 factors that had an effect on the choice of computer science career path in females. They then conducted a study which involved three focus groups of 1000 women and 600 men. These groups consisted of high school students as well as college students and recent graduates. These respondents were also from different geographical regions of the United States.

From the study they found that uncontrollable factors such as a parent’s college major, ethnicity, household income, having a sibling in a computer science related field were statistically insignificant. They also discovered some controllable factors such as early exposure to technology, access to mobile devices, age of first computer exposure etc but stated these were not truly influential in a female choosing a computer science degree. Their final deduction was that most important factors that affected a female’s choice of a computer science degree were controllable and interrelated. These factors are : academic exposure to computer science curriculum both in formal settings like school and informal settings such as extracurricular activities; individual perception of one’s aptitude for problem solving, being able to participate in such activities in a supportive environment; perception of the field which is impacted by the presence of female role models, an understanding of the social impact possible/variability of career paths in the field; social encouragement from family, educators and especially from peers.

Varma, R., & LaFever, M. (2006). Motivating women to computer science education. In E. M. Trauth (Ed.), Encyclopedia of Gender and Information Technology ( pp. 900-906). Hershey, PA: Idea Group Publishing. Available at <http://www.unm.edu/~varma/print/Motivation.pdf>

This paper was based on a study done to analyze motivation factors among genders for a career in CS. These factors ultimately affect the retention of women in the field of computer science. There were 66 students selected for the survey form four minority serving institutions. The participants were males and females of varied ethnicities ranging from African American, white, Asian American, Hispanic to Native American. Participants were asked the same set of 61 interview questions with 15 of those questions targeting specific data about their motivations to study computer science. A coding analysis scheme was developed based on six motivation variables. These variables fall into intrinsic economic, intrinsic self and intrinsic social; extrinsic economic, extrinsic self and extrinsic social. Demographic information collected include socio-economic background of parents, age range of participants, marital status, educational major , employment, school year etc.

The result of the studies show that in both males and females, the intrinsic self( individual’s strong aptitude and interest in computer science) was the primary motivation for enrollment. In addition to that at enrollment phase, a much higher proportion of male students’ motivation to study computer science fell under the intrinsic-social which involved the possibility of using computer science to solve social and humanitarian problems. However by the time actual coursework began , female seemed to level up to the males placing this as a motivation for studying computer science. This could mean that more needs to be done to demonstrate to females the connection between computer science and social values at pre-enrollment. Females also exhibited a significant drop in intrinsic- self(interest ) by the time coursework began as opposed to males who maintained this motivation. Lastly, in the area of extrinsic-economic(job prospects, benefits/rewards) , there was significant increase in male respondents in this regard by the time coursework was underway. This was different from the results of the data collected about enrollment motivation in which males and females both had about equal percentages for this factor when polled. This also agrees with information available that a higher percentage of males take advantage of career development opportunities like internships, co-ops in the IT industry while in school. The study makes some important points which are that prior efforts focused on boosting female recruitment in computer science have been based on an individuals sustained interest in computers and enjoyment of the challenges associated with problem solving. These motivations like everything in life, change overt time as the student garners life experiences.

American Association of University Women. (2010). Improve Girls’ and Women’s Opportunities in Science, Technology, Engineering, and Math. Available at <https://www.aauw.org/files/2013/02/position-on-STEM-education-111.pdf>

The American Association of University Women focuses on the reduction of gender barriers that prevent women and minorities from participating in the Science, Technology, Engineering and Math(STEM) and promotes this as a means of boosting a country’s competitiveness ; ability to innovate. Careers in STEM are responsible for creating , maintaining and managing the products of innovation which are in turn necessary for a nation’s sustained economic growth. However, with a large percentage of the workforce aging and supply of skilled personnel struggling to keep up with demand, it is a wonder how women who make up about half of the population are still grossly underrepresented in the workplace. Women are a viable solution to the labor shortage being experience in the country and efforts should be placed on integrating them into the workforce. This article proffers suggestions on how to do this.

According to the article , it was discovered that the apathy towards careers in STEM starts from early childhood and gets worse as children approach their middle school years and progress into high school. Inquiry into this shows that a lot of the disinterest stems from a jaded perception of computer science and its related fields as being too reclusive; not societally acceptable ; not socially acceptable by their peers. Post-secondary education in Stem fields creates greater economic security for women as they earn on average 80 percent more than their counterparts with only a high school diploma. However, in the course of their studies, they also found that a higher percentage of women who currently have careers or hold academic positions in computer science believe that they have faced discrimination and that their gender has in some way retarded their overall progression.

The American Association of University Women therefore hopes to improve opportunities for women in STEM by : Firstly, supporting efforts that train teachers who can encourage females and minorities to pursue STEM careers by engaging them with a full understanding of the social and gender-based challenges they face. They believe in the importance of developing teachers with sufficient competence and also providing funding for the continuous development of content in math and science. Secondly,They also believe that an emphasis should be placed on math and science education all through a child development from early childhood with the intention of empowering students with the knowledge of what is required to be competitive in the global market. Thirdly , they believe in the inclusion of STEM subjects in extracurricular activities as well as the provision of summer internships opportunities for students to see the application of classroom principles in solving human concerns. Lastly, they believe that there should be routine review of academic institutions that receive federal funding for research in math and science and comparison of data from various academic institutions about grantees and selection policies, to ensure that there is no gender based discrimination taking place.

Varma, Roli. (2009). Why I chose computer science? Women in India. AMCIS 2009 Proceedings Paper 413 Available at <https://www.researchgate.net/publication/220892867_Why_I_Chose_Computer_Science_Women_in_India>

This paper examines why despite the patriarchal system present in India, more women there are choosing to earn degrees in computer science compared to countries like US. In a preliminary study in the US, 150 students participated. The respondents included males and females from five major racial groups African American, white, Hispanic, Asian American and Native American at 7 minority serving tertiary institutions. The study in India was conducted at four tertiary institutions with 6O female respondents. Questions were asked to ascertain what, who caused them to develop interest in computer science and when this interest started. Few of the respondents reportedly had access to computers prior to eight grade and others had some access to computer facilities in high school but also added that many of their computer laboratories were poorly equipped.

Another factor that sparked interest in computer science for many was the presence of a family member especially male figures who owned computers or were studying computer science/engineering. Apparently these male figures were very influential in them choosing computer science degrees because they shared positive experiences with them and presented the field as suitable for women since it did not require physical labor. Many of the respondents also based their decision on a practical assessment of the potentials of the field and possibilities for future employment. A sixth of the respondents had advanced computer proficiency and the other half were split between having basic proficiency and little to no computer experience by the time university placement exams were taken. The students stated that a major reason for their success in computer science was due to their strong mathematical background(which teaches logical and rational thinking) that they had developed from school and private coaching with many of the respondents citing mathematics as their favorite subject.

It was discovered that the indian educational system requires advanced mathematical skills as opposed to the United states in which advanced mathematics is optional. The US system also is more flexible allowing students to change majors more easily which is not common place in India. Indian students are more likely to work harder to address any academic challenges instead of switching programs. There is also a strong desire in Indian women to remain technologically relevant and the field presents more job opportunities which will help them attain social and economic independence.

Roberts, E. S., Kassianidou, M. and Irani, L. 2002. Encouraging women in computer science. *ACM SIGCSE Bulletin*, 34(2): 84–88. Available at <https://cs.stanford.edu/people/eroberts/papers/SIGCSE-Inroads/EncouragingWomenInCS.pdf>

This paper focused on the strategies employed at Stanford University that were successful in increasing the recruitment and retention of women at the undergraduate level. They believe that while it is important to increase the percentage of women in computer science as a whole, it is more useful to focus on increasing the number of women actually enrolling in computer science programs. Some of these strategies are explained in detail.

Firstly, creation of wide audience introductory computer science courses which served as feeder for the computer science program. These courses are designed to be attractive to all majors, adequate support is given to ensure as many student as possible are successful. They also ensure that female lecturers, teaching assistants and upperclassmen are actively involved in leading many of these classes. For the female freshmen it has been beneficial to see women at various academic levels who serve as role models. Secondly, from their studies they discovered that most of the factors that lead to low female enrollment in STEM programs start very early on. They have therefore implemented several bridge programs to prepare students for STEM coursework at the college level. These programs are particularly targeted at women and minorities who are at greater risk of leaving Stem programs. Thirdly, they have established a research internship programs which match undergraduate students to faculty mentors. Students apply for research projects that match their interest and are then selected based on academic record and experience. The authors agree that the initiatives they have implemented only solve a small part of the problem and are seeking to develop more strategies by creating an atmosphere for discussion between faculty and undergraduates, graduate students in the department. One interesting strategy that resulted from their deliberations was the need to provide students with a better sense of the spectrum of opportunities in computer science and debunk the myth that computer science is limited to programming.

Osunde, J., Windall, G., Bacon, L., & Mackinnon, L. (2014). Female Underrepresentation in Computing Education and Industry - A Survey of Issues and Interventions. International Journal of Advanced Computer Science and Applications, 5(10). Available at <http://oro.open.ac.uk/51015/1/17235%2520MACKINNON_Female_Under-Representation_in_Computing_2014.pdf>

This paper examined the studies on female underrepresentation in computing as well as provided arguments to explain this phenomenon and strategies that could help alleviate the problem. In this paper, they state that the causes of female underrepresentation in computing are grouped into three based on biological differences, socio-cultural factors and structural factors. The first group of causes is based on the essentialist argument which promotes the viewpoint that the male brain possesses superiority in mathematical computation, reasoning and spatial cognition thereby making it suitable for careers linked with the design and construction of systems like engineering and computer science. This argument also states that the female brain is better wired for empathy which would why women are drawn to careers in socially demanding environment and healthcare.

The next group of causes fall under socio-cultural argument which states that innate human qualities like intelligence are not pre-requisites for success in computing rather that success in computer-linked abilities are based on socially engineered factors like confidence in one’s ability which boys seem to have more than girls in respect to computing and public perception as largely portrayed by media of what the ideal computer expert should look like. The last set of causes are structural factors which include: Firstly, family responsibilities which usually affect women more; Secondly, the computer science learning environment which is usually depicted as nerdy and hostile. According to their findings, women prefer environments that encourage social interaction and focus on solving social problems while men do not, and are therefore not drawn to computing. Thirdly, attirude towards computers. Studies have shown that men have a more positive attitude towards computers as opposed to women who seem to express more anxiety about dealing with computers which may be as a result of identity roles formed at each stage of socialization. Intervention strategies implemented that proved helpful include:

Firstly , pair grogramming , gender grouping and role models; Secondly, creation of working initiatives and associations to further encourage mentoring, create awareness and boost interest of girls in IT careers; Thirdly, implementation of educational policies to include computer science in from K-12 curriculum as well as development opportunities for teachers to ensure that they are able to properly engage students with computer science subjects; Lastly, though have, gender specific games have not seen much success in females because they are often stereotypical. Studies are being conducted to find better ways of exploiting educational computer games to encourage females to study the discipline of computing since there is an increasing number of females interested in video games as a form of entertainment.

[Patitsas, E. , Craig, M. & Easterbrook, S.(2014) A historical examination of the social factors affecting female participation in computing, Proceedings of the 2014 conference on Innovation & technology in computer science education, Uppsala, Sweden](https://dl.acm.org/citation.cfm?id=2591731) Available at <http://www.cs.toronto.edu/~sme/papers/2014/Patitsas-ITiCSE2014.pdf>

This paper gave a historical examination of the social factors that affected female participation over the years. In the 19th century, as laws banning women from education were loosened, fights and campaigns against discrimination of women in society led to the rise of women colleges. Most of these campaigns came from the premise that higher education produced better wives and mothers. Many of the women of this time that studied math and science were the daughters of scientists and popular intellectuals. Many of the women who attended colleges had no job prospects beyond teaching in the womens’ colleges and opting to pursue a phd meant forgoing marriage, It had to be one or the other. As time progressed, woman began to aspire to have have both careers and families but were met with opposition. Between the mid 19th century and the early 20th century , women had slowly begun enrolling at traditional male institutions but there was still no equality in the workplace. This time period saw the development of the phrase “womens work” where women worked as assistants to scientists and did the computer/machine coding under the supervision of a male scientist. It is interesting to find that in this time period , women were seen as more suited for quantitative tasks and men for qualitative tasks in contrast to the reversal of roles that is prevalent today.

During the world war the scope of women’s work widened but the leadership roles were still given to men. Between the 1950s to the 1970s, as computers became commercialized, programming became more of a coveted skill but not much was really known about what a good programmer was. Over time, men became involved in coding and and the public perception of began to tilt to it becoming a masculine task requiring a lot of isolation. Between the 1960s and 1970s, the few women who studied computer science came from other disciplines such as math, electrical engineering, physics, English etc and because there was so much opposition to them even starting the program, the few who eventually did were considered tough. The culture and practices of the time were designed to suit men and so the women of this time had lifestyles mimicking the traditional man with a singular focus on career and research development with marriage and children being an afterthought.

By the late 1980s , due to the insufficient faculty to cater to the increasing number of CS students, stringent policies were put in place at academic institutions to reduce enrollment. This made entry to Computer science programs more difficult for women and minorities. By the 1990s the drop in female enrollment in computer became a concern as computing became more masculinized. Enrollment spiked again in the late 90s with the introduction of the World Wide Web but had declined again by the early 2000s. Before the mid 2000s , computer science enrollment seemed to have bubble periods of high enrollment and bust periods where enrollment dropped and with it female enrollment. As women began being hired as STEM faculty, the generation of women who entered in academics in the 1980s and 1990s had a few role models to look to. While the previous generations struggles were trying to get into the industry, this generation’s preoccupation is more for how to balance work and family.

Women entering computer science in the late 2000s and 2010s do not face explicit sexism and discrimination to the degree that generations before them. More networks, role models, resources and opportunities are now available but the predominant barriers faced by the present day woman in computer science are subtle/implicit sexism.

Deloitte.(2016).Women in IT Jobs : it is about education, but it is also about more than just education. Available at <https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Technology-Media-Telecommunications/gx-tmt-prediction2016-women-it-jobs.pdf>

Recruiting and retaining women in IT jobs is about education, but it is also about more than just education. Granted female enrollment in computer science programs is low but an even smaller proportion of these female graduates actually end up with careers in the IT sector. Compared to 1 IN 10 men with a STEM degree who leave the IT sector, 1 in 5 women leave the IT sector. This report highlights reasons why there may be a low retention rate for women and female STEM graduates in the IT sector. Firstly , the problem starts at the recruiting stage. Some firms use keywords in job descriptions which could be turning away female applicants and some softwares showing advertisements for jobs target users tagged as men about six times as often as female users. In the hiring process, it has also been discovered that when female applicants were interviewed by all-male panels, they were more likely to turn down the job offers. In order to curtail this, companies have tried to ensure at least one female interviewer in present during the recruiting process.

Also studies have also shown that female candidates are less likely to promote themselves as opposed to men, so some companies now ask candidates more detailed questions in order to get a full assessment of candidates. Also in terms of retention of female employees in the sectors challenges included insufficient maternity leave and pay leading to many female employees leaving after childbirth. Another challenge was a lack of female mentors, lack of confidence/willingness amongst Female employees to seek promotions, the pay inequality between males and female with similar roles. However, in recent years female employment in top IT companies(silicon valley companies) has seen an increase but expecting this to reflect across the US may be unrealistic.

Varol, H., Varol, C. (2014) Improving female student retention in computer science during the first programming course. International Journal of Information and Education Technology 4(5): 394–398. Available at <http://www.ijiet.org/papers/437-EI0010.pdf>

The main rationale behind this study is that some students change majors their first computer science course. The first programming course has been found to have a high impact on retention of female students in computer science. Two survey were conducted in the course of the semester at Sam Houston State University with female students taking the Programming fundamentals course. At this university, 6 out of 10 students at female but in the introductory level programming classes, only 4 out of 10 are female and only 1 out of ten computer science degrees are awarded to females. The respondents were from different majors. The first survey took place in the first quarter of the semester and the second was taken close to the end of the semester.

In the first survey students were asked a broad spectrum of questions to find their major, time spent on syntax problems vs logical problems, computer skills, background, student-faculty interaction, programming editor used etc. Th second survey focused on their feelings on their interest in future progress in studying computer science. In the initial survey, 68% of the students indicates that they had challenges with syntax problems and 42% stated they had difficulties cresting algorithms to solve tasks. A dragon drop application was developed to assist with the syntax problems and decrease debugging time for students. This reduced the complaints regarding syntax difficulties to 9% and complaints regarding algorithms to 29%. However the downside to this approach is that it may put leaners at a disadvantage since they are not able to pick up critical debugging skills that experienced programmers need but it is believed that the students should be able to pick uo these ksills when taking upper level programming coursework.

Many of the students also stated that they would prefer assignment materials that are prepare in a way so that students are reminded account concepts as well and given hints, partial code to solve the problems. The students also stated that getting involved in computer science student associations was very helpful to them. They also found that availability of extra study sessions with the instructors, teaching assistants served as a factor for student retention. As expected students with prior programming experience exhibited higher retention rates but they found that by the end of the course ,with issues observed in the first survey addressed, female students expressed overall positive feelings in female students about the computer science major.

Zagami, J., Boden, M., Keane, T., Moreton, B., & Schulz, K. (2015). Girls and computing: Female participation in computing in Schools. Australian Educational Computing, 30(2). Available at <http://qa.eq.edu.au/wp-content/uploads/Girls-and-Computer-Science-Paper-.pdf>

This paper deduces that the only discernable difference between efforts to boost female participation in computing and those that were successful in other field is the availability of compulsory developmental curriculum from the early stages in school. They believe this will provide a base that will sustain female participation in periods where it sees its sharpest decline such as adolescence. The US National Science Board reported a decline in female participation in computer science fri=om a 37% peak in the mid 1980s to 18% in 2012. In Australia, only 2.8% of girls compared to 16.3 of boys contemplate pursuing careers in computing. At the elementary school level, female participation in computing since is fairly equal to male participation but the significant decline reportedly starts in high school. A study was conducted where viewpoints were collected form professional associations, female participation initiative groups, academics, It companies, teachers and students. Four major approaches for improving female participation in K-12 computer science in Australia were developed. Firstly, efforts need to be made to engage female students with digital technologies curriculum. Secondly, since parental influence plays a major role in females perception of professions in computing, parents need to be made aware of the variety of professions and possibilities for women in computing related careers.

Certain pre-existing misconceptions about the field need to be addressed through workshops in schools and by placing articles in parent magazines, school newsletters. Thirdly, because of the shortage of relevant role models to serve as success stories, many young women lack role models in the IT industry. Opportunities need to be created for professional and academics to share experiences and mentor school-aged students. Lastly, creation of extracurricular coding activities for girls that can cater to their interests and enable them socialize with girls their own age which will grant them exposure to computer science and encourage them to consider careers in computing. Also in addition to these , prioritizing initiatives to integrate digital technologies subjects into the curriculum in order ensure sustained interest in females over the years 7-8 when female participation start to decline .

de Palma, P. (2001), “*Why women avoid computer science*”, *Communications of the ACM*, Vol. 44 No. 6, pp. 27‐9. Available at <http://cs.furman.edu/~ktreu/csc101/docs/17women.pdf>

This paper proffers possible solutions in an attempt to make computing more hospitable for girls. There has been a decline in female enrollment in computer science degree over the years but statistics show that women embrace the precision of mathematics. The author looks to the field of mathematics where women have shown sustained interest over the years. The hypothesis is to make computer science more attractive to women, it should be made more like mathematics. Firstly, teach girls with aptitude for symbol manipulation how to program. The authors believe that since programming is similar to solving a math problem in that both involve discovering a pattern with logic. Therefore, if girls can do mathematics, they can program. Secondly, when teaching girls how to program, things should be kept as close to pure logic as possible and less on the learning to use the latest or most sophisticated software packages, text editors. Thirdly, teach computing without microcomputers. The authors believes that boys have a naturally enjoy tinkering which involves taking things apart, understanding them and rebuilding more than girls. So to teach computing, take away the distractions of hardware. Fourthly , similar to mathematics, keep programs short in the early stages. Instead of giving students long programming assignments where they must design,code,debug test and document, they should be asked to write many small identical programs. As they gain mastery, they can then move to more complex problems. Finally, teachers should treat programming languages as notational systems and resist the urge to adopt every new programming language no matter the public excitement associated with it . Basically they should use a programming language appropriate for a task to teach and should not change it till students have attained a high degree of understanding.

Graham, H., Fuertes, V., Egdell, V., & Raeside, R. (2016).Women in ICT and Digital Technologies. Available at <https://www.napier.ac.uk/~/media/worktribe/output-408031/women-in-ict-and-digital-technologies-executive-summary-251016.pdf>

This report summarized research conducted conducted by the employment Research Institute in Scotland to explore female under-representation in ICT , the possible reason for this problem and proffer solution. The same issues in other countries were found in Scotland such as gender pay gaps and gendered segregation of the IT industry with men being more likely to hold leadership or managerial positions. Research on existing literature on gender disparities in the IT sector were examined as well as initiatives that had been implemented in other countries to improve female representation. An online survey followed by a qualitative interviews of focus groups was conducted with 13 employers,29 employees,14 university staff. Qualitative Research was also undertaken with 11 IT recruiters, 5 primary and secondary school computing teachers and 9 member of professional bodies. Lastly, a paper based survey was administered to secondary school pupils to explore their attitude toward pursuing studies in computer science and later working in the IT sector. There are some factors they discovered that could account for the under-representation of women in ICT sector. Firstly, the imbalance they believe starts at school as girls are not taking the relevant subjects at the high school level but also form a very small percentage of those pursuing degrees in computer science(only 16%). Secondary school girls also have a negative response towards IT at school or career prospects in IT compared to male students. Some features of the industry that also explain women not entering the sector include the negative and stereotypical portrayal of people who work in the sector by the media, shortage of female role models in the industry, the extensive time commitment expected from employees, the domination of males in the workplace that has led to work practices that doe not favor women, negative assumptions abut the competency of females in the industry by employers and clients. They believe the solution to these problems lie in increasing female participation at the school level by encouraging their engagement with computing subjects, partnerships with industry to create awareness about opportunities in the sector, creating mentoring and networking opportunities to support female students , creating awareness in the workplace about the benefits of gender diversity and encouraging employers and employees in the industry to challenge discrimination.

CONCLUSION

Female underrepresentation in the field of computer science in the United States has always been a challenge, but in recent years it has been on a downward trend with less girls taking computer science advanced placement exams and enrolling in computer science degrees. This also translates into the workplace. Surprisingly ,women in some countries like India, as discussed earlier seem to have a better perception about the prospects for women in the field of computer science. However in most countries, female participation in the field is very low and the perceptions of young girls hold many misconceptions about the field. Some major points have been made on the challenges faced by women with similar themes in each article. Firstly, many of the articles believe the challenge starts from middle school years(grades 7-8). At this time a lot of girls begin to look to their peers and the media in order to form their ideas about themselves and the world. Since the public’s portrayal of computer science is mostly that the field is a nerdy, masculine, reclusive field ; many young girls lose interest.

Over the years, efforts have been made by schools and professional bodies to change the public opinion by providing female role models, mentoring and extracurricular clubs to ensure that girls perception of the field changes over time. Some also believe that the challenge lies in the fact that inmost schools, there is compulsory computer science curriculum unlike courses like science and math. Therefore there is no way to ensure sustained interest in the field as girls grow. Commitments have been made to integrate computer science subjects into the curriculum from elementary schools and some organizations have proposed that teachers need to be better equipped to impart knowledge to the students and have provided scholarships, trainings and grants that support teaching professionals.

Many of these initiatives have seen some positive effect, yet each year the percentages of girls enrolling for these degrees keep dropping. Some are of the school of thought that the field of computer science is better suited for men, stating that men possess superior mathematical reasoning cognitive ability and are therefore better suited for the field, but there are no studies or statistics to prove this. Some challenges in the work place have been highlighted in various articles like implicit and explicit discrimination, unfair work practices that disfavor women , pay inequality, shortage of females role models etc . Since there are no studies that prove any gender is cognitively superior and therefore better suited for computer science, it may eventually come down to choice. There is the possibility that in the future as these measures are continually implemented, things may reverse as was the case in the past and computing may become a majorly female profession.