Unlocking the clubhouse: Women in computing, by Margolis, J., & Fisher, A.; MIT Press, Cambridge, 2003, $12.95 (paperback), ISBN-0-262-63269-1

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Unlocking the clubhouse: Women in computing (Margolis & Fisher, 2003) explores challenges that female students encounter in undergraduate computer science programs, revealing prejudices and stereotypes they are confronted with, despite outward appearances of openness and equity. This book not only reveals sociocultural differences and inequities between genders, but also offers practical paths to improve females' participation. The research took place in Carnegie Mellon University, at the Faculty of Computer Science, and spanned four years with over one hundred computer science students participating in this study.

In this study, female students registered in computer science programs lacked role models of female computer scientists and perceived actual software as mostly for males. The computer science culture is described as centered around male hackers and overlooking female perspectives. The field of computer science is presented as a male-dominated community, narrowly focused toward programming without any connection to other particular domains. As one female interviewee remarked "they [male students] believe that staying up all night programming is a sign of love for computer science and that not doing so is a sign that one doesn't love it" (p. 74). Thus, many female students who lack this approach tend to feel disappointed that computer science is not for them. This unbalanced situation between genders is considered by the authors to be similar to science and mathematics education, which have had similar problems in the past.

Some discussions from this book refer to the presence of minorities in computer science classrooms. This research noted that many female students are from ethnic backgrounds such as East Asian or East European. The authors considered that having different cultural norms and values makes them probably more able to cope with computer challenges: "Ironically, it is in this area of relationship to the culture that the international women may have an edge. The international women do not as readily use the US male hacker as their reference groups. Since they are not fully part of this culture, their reference group is elsewhere" (p.103).

Lack of adequate quality of teaching is seen by Margolis and Fisher as a major concern in computer science education. This research confirmed that teachers receive inadequate opportunities for learning computer science. Therefore, an important contribution of this research was to focus on teaching improvement. For instance, the best instructors were assigned to the introductory courses, where female students traditionally reported difficulties. Also, the instructors were asked to be more aware when teaching culturally diverse students, in particular of issues related to gender equity. Another important episode was an inservice course for 240 high school teachers in computer science, where not only details about the content of programming languages were discussed, but also some social aspects of teaching computers. For instance, cases were presented of female students struggling, when they are in a small number or without previous experience in computing.

In this book, Margolis and Fisher attempted not only teaching improvements but also reforms in undergraduate computer science curriculum at Carnegie Mellon. First, they adapted the curriculum for the computer science students who were registered in the first year of study. According to their associated degree of difficulty, the programming courses were categorized in four levels, so that students could register in these courses according to their level of expertise. For instance, for those with little experiences in computers, the designed course had discovery-based approaches, with the general level being lowered. In contrast, for those with experience in programming, the pace of instruction was intense, so that students received advanced assessments at an early stage. Second, they contextualized the computer science curriculum by including more practical assessments that were

linked with real-life examples such as incorporating natural language, real-world data and socially relevant components.

The discourse gradually shifts from frequent cases of discouragements and dropouts to find resilience and support for new learning communities formed among women. Linked with adequate counselling support for female students, the intervention was able to gradually increase the number of female students registered in computer science programs and also helped them cooperate and be aware of possible academic and professional struggles. By gradually increasing the number of female students registered in undergraduate computer science, women were protected from the negative effects produced by isolation and tokenization. These counselling programs gave female students reliable advice about how they might cope with various challenges. Even with a low level of experience in computers, most female students received opportunities to improve their practice. Another contribution was to increase the awareness of female role models among female students. A series of lecturers were included for the purpose of students' adjustment to university in which female role models in computer science were presented. Overall, building an increasing network of female computer science students was a sustainable and promising approach. As a result of this research intervention, the number of female students enrolled in computer science programs increased from 7 percent of the students in 1995, the date when the research started, to 42 percent in 2000, the date when the research was completed.

There are some possible issues in this book that I would like to mention. First, the analysis of other factors such as ethnicity and social economic status were not systematically presented in this study. Therefore, readers might miss some important aspects about the complex sociocultural issues in computer science education (Cohoon & Aspray, 2006; Margolis, Estrella, Goode, Holme, & Nao, 2008). This approach is somewhat understandable, since the research was focused mainly on gender. Second, the research ignored counselling for male students having difficulties in this program. Also, it might be argued that this book is mainly Margolis' voice and that the voice of Fisher (or the voice of any male researcher) is missing. This might be understandable also, since Fisher is not an educational researcher, but a professor and administrator in computer science. Therefore, his main role in this project was to participate in designing undergraduate programs based on findings reported about gender inequalities. In my opinion, as a male researcher in gender and technology, this research could better negotiate identities and viewpoints from the perspectives of both genders. On the other hand, it might be argued that this study needed to focus on the voice of undergraduate female students that were ignored so far in the mainstream computer science education, and many aspects that seem to be presented only from a feminist perspective offer important benefits for a balance between genders.

Despite some issues previously mentioned, this research represents a major step in the domain of inclusive education in computer science. This book is highly recommended for educators, researchers, feminists, and students interested in sociocultural issues of computer science education. What makes Margolis' voice unique is her persistent effort in studying inequities in computer science education and not just peripheral aspects of using technologies, as well as her commitment to fight against social inequities. The results of this outstanding intervention made this study famous not only in the US but also across the world. The epilogue of the book predicts an optimistic future for computer science education, when our society will be able to solve stereotypical issues in technology in all macro and micro societal levels, as other disciplines such as medicine did already. As this study makes clear, in order to achieve a balanced participation between genders in computer science programs, these interventions require great efforts that should be made not only at individual levels of teaching, but also as a collaborative effort between administrators, teachers, and technologists.

References

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