Can Mentoring be used as a Positive Action to favor the presence of Women in Science?

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Abstract

Mentoring is the establishment of a one-to-one relationship between an experienced person, the mentor, and a less experienced person, the mentee, aimed at providing professional instruction and guidance. Several mentoring initiatives have been set up over the past ten years, either in Europe or in USA, in order to favor the presence of women in science and technology. At the high school level, mentoring has been designed to encourage girls to enter scientific universities; at the university level, female students have been given support to develop their research skills and decide about their profession; at the graduated student level, women have been helped in starting their professional career.

This contribution focuses on mentoring experiences made by women in the specific fields of Engineering and Computer Science. The purpose of our analysis is to identify motivations behind mentoring initiatives and critical issues to be faced when designing this kind of experiences. A further objective is that of verifying the possibility to start a similar initiative in our institute, a research institute active in different fields of science and technology.

1. Introduction

A picture of women’s situation in science has been recently provided by the ETAN [1] survey, sponsored by the European Community. This study has played a quite provocative role in bringing some points to our attention regarding the theme "gender and science". An important effect has been also that people started discussing it at different levels [2],[3].

Two main points result from ETAN report:
- the presence of an horizontal discrimination related to gender diversity, that is the fact that women seem to dislike scientific and technological fields, such as Physics and some Engineering sectors;
- the presence of a vertical discrimination inside the professional career (called also scissors phenomena in career) proved by the fact that the percentage of women decreases when we consider higher levels in the career path.

This raises several questions, such as:
- what discourages women who successfully conclude their studies in scientific faculties, to apply for research positions?
- why is it that women working as research scientists have less brilliant careers than their male colleagues?
- how to design and implement effective actions devoted to reducing these discrimination phenomena?

Concerning the first question, it seems to us [3] that ETAN data were too optimistic. In sectors such as Computer Science and Information Technology, Physics and Electronic Engineering, the percentage of
women attending faculty studies seems to be less than 20%, in line with the presence of women as young researchers in the labs.

Several mentoring experiences in Engineering and Computer Science proved to be effective in promoting the presence of women in science and engineering faculties or in research labs active in those fields, and in favoring the progress in career of young women. Among the key factors, it was relevant the exploitation of role models mechanisms and the setting up of a network, which helped the single to overcome critical situations.

In Section 2 of this contribution, we first recall some basic concepts of mentoring. In Section 3, we consider relevant mentoring initiatives set up in different universities in Europe and USA. From the analysis of these experiences we extract a list of critical issues to be faced when designing a mentoring initiative and discuss them in Section 4. We will sketch a proposal for a mentoring initiative in our Institute in Section 5. Conclusion and future work are given in Section 6.

2. Mentoring concepts

Generally speaking, mentoring is the establishment of a personal relationship for the purpose of professional instruction and guidance: an experienced person, the mentor, provides advice, support, and encouragement to a less experienced person, the mentee or protege. Being mentored provides a lot of benefits. First of all, an increased understanding of a discipline or an organization, knowledge of unwritten rules of engineering and science that is difficult to be learned by him/herself. Furthermore mentoring gives access to networks and other resources, which can be very useful for a career in industry or research later on. Finally, the mentee will see increased self-confidence and self-esteem. Also mentors benefit by mentoring, which is considered an opportunity for self-reflection about their career path and an occasion to gain an increased understanding of their disciplines [4].

An electronic version of mentoring is the telementoring, in which the exchange of information between the mentor and the mentee takes place in the electronic world of email and secured online discussion forums [5],[6],[7],[8]. There are several reasons that support telementoring as a positive application of mentoring. For instance, a student and his/her mentor could live in different cities or even states. Because communications occur by way of email, there are no time constraints on a student or his/her mentor reading and responding to messages. Email also makes easy to communicate because it removes most obvious markers of status difference. Finally, using electronic tools to communicate automatically provides a record of communication, so students can refer to their mentors’ advice every time they need it.

Mentoring typically rests on a one-to-one relationship. This fact involves many interesting aspects, such as trust requirements, time availability and professional competences of the mentors.

3. Experiences in Europe and in USA

To investigate which are the most critical issues in setting up an effective mentoring action, we have examined some projects acting in different contexts: in the high school context [9], where girls are encouraged to enter scientific universities; in the university context [10], where mentors, usually professors or senior researchers, help female students in developing research skills and in deciding about their future profession; and finally, in the context where young women are entering into the work world [11], where engineers or information
technology professionals or researchers help them in starting their professional career.

We focused, in particular, on mentoring initiatives in European and USA Universities and Research Institutes in Science, Engineering and Information Technology fields, which are closer to our working environment.

Among the European mentoring experiences, we would like to mention those projects we consider as the most interesting: the “Athena” project [12], the “Mellow” project [13], the “Ada Lovelace” project [14] and the “Mentornet.ch” network [15].

The Athena project was organized by WiTEC UK, the English section of WiTEC, one of the most widespread European organization studying the Gender and Science topic and promoting initiatives about it. The main objective of the Athena project was to define training courses for mentors.

The “Mellow” project is still operating in Netherlands; it is an example of action addressed either to high-school and to work level.

The “Ada Lovelace” project, still operating in Germany, is very close to the “Mellow” action.

The “Mentornet.ch” network, active in Swiss, is a positive example of electronic mentoring.

Among the USA mentoring experiences we have considered the following: the CCT Telementoring project [16], the MentorNet [4], and the CRA-W action [17].

The Telementoring Project, developed by CCT [18] (Center for Children and Technology – New York), provides young women in high school with ongoing guidance and support. CCT experts developed Internet-based telementoring environments that linked young women attending pre-engineering classes with women professionals in science and technical fields.

MentorNet is an e-mentoring network for women in engineering and science. It is a nonprofit initiative sponsored through grants, which links pair women who are studying engineering or science at one of colleges or universities participating in the network, with professional scientist and engineers working in industry. The mission of MentorNet is to further women’s progress in scientific and technological fields through use of a dynamic, technology-supported mentoring program, to advance women and society, and enhance engineering and related sciences, by promoting a diversified, expanded and talented workforce.

CRA-W (Committee on the Status of Women in Computing Research), funded by the National Science Foundation of U.S.A., is an action oriented organization dedicated to increasing the number of women participating to Computer Science and Engineering research and education at all levels. The committee is also aimed at increasing the degree of success the women experience and to provide a forum for addressing problems. CRA-W provides a good example of a different kind of mentoring, based not only on a one-on-one relationships but also on thematic seminars for both mentors and mentees, on topics such as how to build a research career, how to get a job, how to obtain funding from the local or national government or industry, and so on.

4. Critical issues

The analysis of the mentoring actions mentioned in the above section allowed us to identify critical issues to be considered in implementing an effective mentoring initiative. Among them:

- participation should be spontaneous;
- the top levels of the institutions (e.g. University) where the mentoring action should take place must be involved;
- before starting the mentoring initiatives, the staff of the institution must be informed and a personal
opinion should be required, since positive ideas could come from the interviews;

• training of the mentors and mentee. A professional training is required, with experts in communication, psychologists, managers. Mentors and students need to be prepared to see each other as individuals with differing strengths, interests and histories. In case of telementoring, this aspect has to be faced in the appropriate way [19];

• matching students with mentors [4]. It is helpful matching on educational fields, on industry sectors and matching students' level with mentor's earned degree. A match based on similar interests and a sincere effort to build a mentoring relationship result in a mutually beneficial mentoring experience.

5. Design of a mentoring action in a research institute

The basic motivation for starting a mentoring project in our institute ITC-irst [20] is that of setting up an environment that is conducive to the increase of women research scientists and to their empowering. In fact, creating role models is a well-recognized key step towards improving the situation [5]. Our institute conducts basic research and technology transfer initiatives in different fields, ranging from advanced computer science, microelectronics, surface and interface physical chemistry. The institute currently employs more than two hundred researchers and technicians, as well as consultants, students, doctoral researchers. The analysis on the percentage of women vs. men in the research positions and of their progression in career for the period which goes from 1990 to 1999 showed that we are aligned with other similar institute in Italy and in Europe [3].

For our project, we have identified three, different timing, objectives. First, a short-term objective that consists in helping our research scientists who feel stuck in their professional career. This is often the case of women who are isolated from their main working group, due to different causes, but mainly because they are (or have been) pressed by family responsibility. Second, a medium-long term objective, which consists in setting up a mentoring program for young researchers, typically PHD students or candidates to Post Doc positions. Third, a long term objective devoted to attract women in science and technology, through the participation to specific initiatives in collaboration with high schools and universities, aimed at promoting the discussion on gender diversity and science - technology.

In the following, we shall analyze the first objective in more details. Being a good researcher requires to acquire and practice skills such as creative thinking, being able to critically evaluate different solution hypotheses, being able to present his/her own ideas and work, to interact with other research scientists and others [21, COSEUP]. Part of these skills are acquired and carried on during the studies (especially during the PHD period or during stages in research labs), but they need to be constantly (daily) cultivated in order to be reinforced and maintained. Others skills require a good self-esteem, advice and support by senior colleagues of the lab. This is particularly true in critical activities such as maintaining good contacts with top level scientists in the research area of interest; demonstrating progress to people in a position of authority within the institute in order to have their help in facing the next steps; starting to work in a new research field. It is well known that women and men tend to react in a different way to difficulties or failures, such as those that are experienced at check points of some research activities. In particular, it is
recognized that in the case of women, the presence of factors such as isolation, low self-esteem, unusual time pressure arising from family responsibility, lack of relevant experience, can worsen the situation.

In order to reach the above mentioned objectives, we propose to set up a two years program involving a small group of female research scientists, aimed at experimenting specific initiatives devoted to overcome the cited factors.

The program will develop along two parallel paths. The first one devoted to the acquisition or reinforcement of general skills such as self-esteem, communication ability, project management skills. Initiatives within this path will consist in attending specialist workshops run by psychologists or experts in communication techniques, and project management courses. The second path consists in an individual plan aimed at reaching professional scientific objectives that should be identified together with the research coordinator and a mentor, a man or a woman, that should be an expert in the research field the mentee is interested in. The mentor can be either a research scientist working in our institute or not. He/she will follow the mentee in a one-to-one relationship.

The numerous mentoring projects described in Section 3 point out several critical issues (partly discussed in section 4) that should be carefully addressed in order to set up a successful initiative. Among them: preparing mentor and mentee for the roles they will play during the program; define a committee which will follow a suitable methodology for choosing mentor and mentee; this committee will supervise also the whole initiative taking care of and solving possible problems. An evaluation methodology should also be defined, along with to provide an evaluation on the program execution and conclusion.

7. Conclusion

We considered mentoring experiences realized in the specific fields of women in Engineering and Computer Science. The purpose of our analysis was that one of extracting valuable experiences and guide lines for setting up a similar experience in our institute, ITC-irst. In particular, we discussed critical issues to be faced when designing and implementing an effective mentoring initiative, as well as basic motivations for starting a mentoring initiative in ITC-irst.

We are now evaluating possible sources of funding. We are considering ESF programme which provides funding at support of professional re-qualification in different working environments.

A more detailed specification of the mentoring initiative sketched in the paper should be defined taking into account requirements and constraints of the funding programme.

References


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