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Empirical analysis of trends in computer usage among young women in science

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Abstract
The current investigation was undertaken to understand the prevalent trends of computer usage among women in a single-sex higher educational institution. Since gender bias pervades societies throughout the world, we also explored if girls were influenced by gender issues in the field of technology.
A survey was carried out among women students studying science at the undergraduate level at Sophia College in Mumbai city. Our data revealed almost all women to be familiar and comfortable with the use of computers. 27% of the respondents did not possess a computer or had limited access to it due to financial reasons. Few women experienced male-dominated computer culture at home. It was observed that high parental encouragement had led to greater computer use for college work as well as for recreational and exploratory purposes. 41% of the girls had previously attended a course in computer studies and their computer usage mainly pertained to completing assignments and preparing presentations. Though limited by its small sample size, the current study reflects a growing societal change in the attitude of people towards women and technology. This study also gives an insight into how the user group related to computer technology allowing us to get to know the group better.

Keywords: computers, women, gender bias, higher education

1. Introduction
The way we live today is defined by technology. Computers have been an integral part of our lives, changing the way we live, work, communicate and relax. The economic growth of a country depends on the level of penetration of technology amongst the population. With rapidly changing technology, the skills required to keep abreast with the new innovations also keep on changing. Most jobs now require expertise in technical skill.
However, even in countries with widespread access to technology, it has been seen that the level of access by women is lower than that of men. Thus gender discrimination in the field of technology has been always prevalent, especially in the field of computer technology (Crombie, Gail, 1999) [3].
Traditionally, women are seen as incapable of performing on the same level as men when dealing with technology. It is also observed that in a patriarchal society like ours, men enjoy greater privileges with respect to computer access and usage as compared to women. These gender barriers affecting women need to be addressed in order to promote women's empowerment.
There are many women who are interested in the technology field, but are afraid to pursue it. Several studies prove that women not only lack an interest in technology, but they also chose not to enroll in computer classes ("Females and Technology, 2016) [6].
It is also important to understand the trends of computer usage over the last two decades among the youth. Home access to computers and the Internet has expanded dramatically. The lines between computers and other electronic media are getting increasingly blurred. (Child Trends Data Bank, 2015) [2].
It has been seen that women's ability to access income, technology, and paid work improves their children's welfare more than men's access to similar resources. Hence it is very important to improve the access of technology with respect to women. Since computers and technology play an enormous role in the world today, more technology professionals are needed. It is extremely important for more women to become knowledgeable in these areas. This technology gap in women can affect our population and cause it to be unprepared to contribute to the demands of twenty-first century. In order to bring about the change, it is important to be aware of the current levels of technology usage in women.
The current study was undertaken to better understand the familiarity with computers and the prevalent trends of computer usage among young women studying in an all-female higher education institute in an urban environment. Various difficulties faced by these women including financial and gender discrimination were also investigated.
Educating women in computer technology can truly transform lives as it provides knowledge and resources that hold potential for women's empowerment.

2. Material and method
The current investigation was undertaken to understand the trends in computer usage among a population of women students studying in an all-female college. For this, a survey was conducted in Sophia College for Women, a single sex college, located in Mumbai City, the financial capital of India. A questionnaire was formulated for collecting information through the survey.

2.1 Sample
The sample comprised 95 female undergraduate students

studying science in Sophia College. All students who participated were in the age group of 18 to 21. Their academic performance in previous levels ranged from outstanding to average. Some effort was made to balance the groups and computer experience of the sample, through the choice of students contacted. The distribution of students was from a variety of combination of science subjects (Microbiology, Life sciences, Physics, Mathematics, Zoology, and Chemistry). Students studying B.Sc. IT were excluded from this survey intentionally as they are expected to be well-versed with computer technology. The students chosen for this survey were studying for First Year (41) Second Year (22) and Third year (32) Bachelor of Science course. The middle level (SYBSc) group is less-represented in the survey; however it is unlikely that this group uses computer technology more than average. Therefore this paper mostly discusses trends in computer use, which are likely to hold true for the general population of female undergraduate science students.

2.2 Procedure

The questionnaires were distributed in August 2016 among the student populations described above. We used various methods of convenience sampling, distributing 40 % of the questionnaires through student volunteers, 55 % directly through researchers, 5 % through other means. They were mostly distributed and administered within libraries, classrooms and laboratories. The questionnaire was self-administered by 70 % of the sample population.

However direct administration allowed more personal contact, and more in-depth information could be elicited, helping us to get to know the students better. This also let us develop contacts with individual students, for future work. For our survey these factors were important goals.

2.3 Materials

The start of the questionnaire included the questionnaire's aims, and instructions for completing the questionnaire. The body of the questionnaire comprised of ten questions with options added in the form of "Yes" or 'No'.

It investigated mainly the extent of use of computer technology, through desktops, laptops or tablet PC. It included questions about daily usage and purpose for which computer is used. It also included topics like gender bias experienced at home, so that their effect on technology use could be explored. Finally, respondents were asked if they preferred using computers over books for regular studies and whether the use was restricted due to high cost.

3. Results and discussion

Gender issues in the field of technology have been prevalent since ages. While there may be some challenges, the fact remains that "women are still under-represented in technological areas where growing need and opportunity is likely" (Voyles 2004) [12]. This paper presents some of the key results from a study, highlighting trends towards increasing tendency to use computer technology in female undergraduate students, discussing possible reasons for the barriers to effective use of computer technology and how they can be overcome.

In our study, we found that almost all women studying science at the undergraduate level in Sophia College seemed familiar and comfortable with the use of computers. This partly could be attributed to the fact that Sophia College primarily caters to women's educational needs. It is believed that our current education system does not sufficiently engage female students in technology. It has been suggested that one method that could offer women the advantage of learning in a more comfortable and peaceful atmosphere, is in all female classrooms (Harvey and Swain 2001) [8]. Studies show that in such classrooms females seem to participate not only more actively but also more comfortably with increased confidence levels (Crombie *et al*., 2000) [1].

Another factor which also probably served to increase the familiarity of college going women population, surveyed by us, with the use of computers was that a majority of them owned a computer at home. One study in Scotland found that college women were less likely to own a computer than their male counterparts due to unequal financial resources (Gunn, 2003) [7]. Only 27% of the respondents in our current investigation did not possess a computer or had limited access to it due to financial reasons. Greater accessibility had obviously promoted greater use of technology among young women.

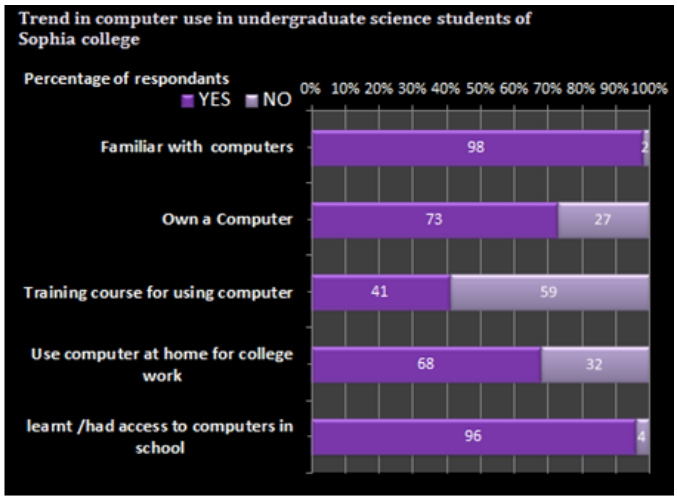

Fig 1: Computer usage among female science students

Since gender bias pervades societies throughout the world, we can expect to find gender bias influencing girls with respect to computing. In the United States, parents were found to give less computer-related support to girls than to boys (Kekelis, Ancheta, *et al*., 2005) [10]. While not specifically about computers, but yet relevant, a study of family behavior found that especially fathers explained the content of science exhibits in a museum three times more to sons than to daughters (Crowley, 2000) [4]. We were interested in knowing whether the student population under study had faced a similar gender bias at home, with greater computer privileges being made available to the male members of their family. Our study surprisingly showed this male-intensive computer culture to be virtually non-existent (Fig 1). High parental encouragement of these girls had led to greater computer usage at home for college work as well as for recreational purposes and exploratory use.

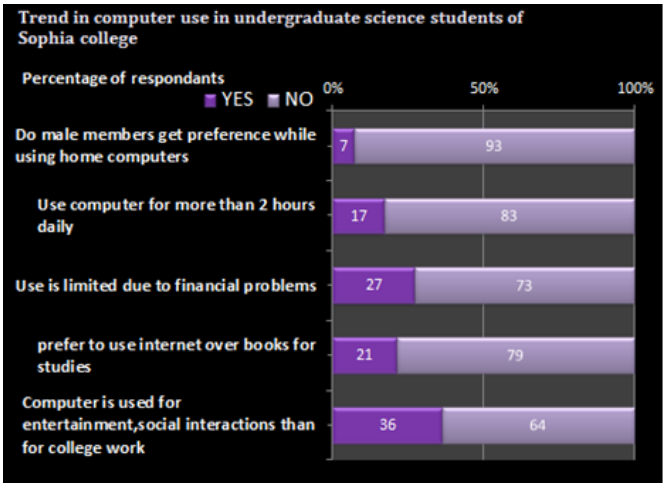

Fig 2: Computer usage trends in female science

Previously, an overwhelming majority of studies have found that boys have an edge in computer use at school, computer course-taking and games. Our data revealed that a significant number of students questioned had ready access to or had learnt to use computers even while at school; while 41% of the girls had additionally also taken a course in computer studies. However, the average computer usage was under two hours daily. This could be attributed to the limited time available to students undertaking rigorous science studies. Most of the female students claimed the time spent using computers was largely for completing assignments and preparing presentations; while fewer students said their computer usage mainly pertained to gaming and social interaction as depicted in the Figure 2.

Overall it has been observed that over the past several years, cost of technology applications in the developing world has decreased while access to these applications has significantly increased, especially in the urban areas. Though connectivity and the availability of reliable educational resources have expanded, we found that a vast majority of student respondents still preferred to refer to books as compared to the internet for academic purposes.

Our current study was limited to a small sample size at a women's only college affiliated to University of Mumbai. Similarly other colleges also need to be explored in order to fully understand the prevalent trends in computer use by women students. Additional detailed studies could be conducted by employing other qualitative techniques, such as interviews and focus groups. It would be also useful to conduct further studies by comparing the use of technology among female students at single-sex colleges with those in co-educational settings.

The survey also evoked discussions of devices not included in the questionnaire. In the future, we hope to build on this work by investigating student's interactions with technology using different modern devices.

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