
Supporting Missing Daughters

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Abstract

We present an ongoing effort to engage women in Computing related discipline while gender based technology divide is a major concern in Bangladesh. We have shared the series of activities that are ongoing along with the positive impact it has created.

Introduction

Gender based technology divide exists in many forms portraying the power dynamics of patriarchal societies. Postcolonial computing [9] plays an indirect role where resources are available without intermediate steps inviting incidents like technology based harassment [9, 12, 42 43,44]. Unfortunately, a larger number of the harassment victims are women. The question naturally arises whether such technology divide is relevant to urban young female adults aspiring for top engineering programs or not [1]. We have investigated the current status of women in their learning environments along with possible ways to support them. It is interesting to note that we had to search horizontally beyond the classrooms to take a look at the family support and social values that may have influenced certain orientations.

There are existing studies that address deliberate installation of gender based technology divide [33]. Gender disparity has been the focus of researchers for long periods of time starting at the beginning of computational studies [19]. There has been an array of research focusing on the apparent fear in women to pursue technology based opportunities [37]. The problem exacerbates in Bangladesh, where a preconceived notion of topics exist which influence a person to choose a particular subject [41]. There has been in-depth studies showing female undergraduates are encouraged to study the social-sciences over

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ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI); Miscellaneous;

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engineering sciences [35]. We cover an in depth literature review in related work section.

The context of urban Bangladesh is interesting as the country has pioneered in female leadership – having female ruler of the country for decades and major workforce being female in garments sector. Similar leadership is expected from female participants in technology related fields. Undergraduate students enrolled in computer science and engineering studies enter undergraduate and graduate schools (University is used frequently in local context) through rigorous competitive exams. Once these students are in the regular curriculum, they are expected to excel regardless of their gender. However, current laboratory performances show significant differences in terms of participation of female students. There have been studies [41] in the context of Bangladesh showing gender based bias in subject selection for undergraduate studies. Female students are expected to study humanities while male students are expected to remain in science and engineering related fields. Ongoing social expectations can be a catalyst which can directly or indirectly impact a female student.

We have conducted a qualitative study to understand the true picture of urban, suburban female students enrolled in computer science and engineering programs. We have conducted a long term study over a period of one year. The methodology is user centric and covers aspects suggested by participants. At the beginning there were calls through emails and social media which spread through the word of mouth and we had a wider range of participants. The authors greatly involved in nationwide initiatives to improve female

participation of youth; shared the concerns in many such events which resulted in discussion on this subject.

Our contribution lies in looking at the possible technology divide among future and emerging technology practitioners and mostly in generating awareness towards it with possible solution approaches through an initiative known as *Missing Daughters*.

Related Work

The trend of lower participation of women in Engineering in the UK is shown in a study by Barnard et al. [19]. Despite the general trend towards more women participating in higher education, subject choices remains segregated [20]. There are subjects in which women form clear majorities like education, medicine, languages, linguistics, and classics as opposed to engineering subjects with only 13% of acceptances were women in 2008 [21]. Some of the reasons researchers [22, 23, 24, 25, 26, 27, 28] attributed to this disparity were: quality of teaching in schools, social skills of the student, presentation of the subject, culture of epistemology -which has been confirmed by our study as well in the perspective of Bangladesh. Some other interesting reasons for the disparity highlighted by Powell et al [29] were: lack of knowledge about engineering occupations even among engineering students, occupational choice being influenced by a certain person's impact in a woman's life and most importantly women holding deep stereotypical beliefs that that men are suited to engineering because of the way the male brain works. Our study also shows such stereotypical beliefs as one of the major causes for the low percentage of women participation in engineering labs. Another study by Masako Hosaka [30] had a similar focus to our study in

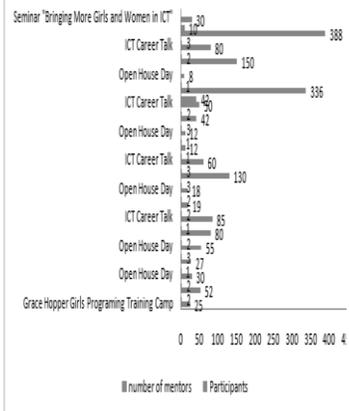


Figure 1. Generic Events arranged in 2017 that required Passive Participation



Figure 2. Grace Hopper Camp, Central Women's University 2017

relation to women's presence in engineering labs in Japan. This study used a qualitative interviewing method of the 32 final-year women engineering students recruited from two moderately selective national universities in Japan. The findings revealed that in laboratories or other group work entailing peer interaction, women had negative experiences with their male peers. Regardless of the female participants', intuitive affinity for engineering, they experienced the laboratory environment as challenging to participate actively because: often being the only woman in the lab (treated as a "token individual"), discouraged interaction between male and female students and lack of confidence among the women in the group. Similar insights came up while we interviewed female engineering students from Bangladesh in our qualitative area of the study

The story of women and technology is not novel, it has been present all along. Mary Wyer et al. [10] observed how gender plays a role in the context of science and technology related fields. Sherry Tuckle [12] goes back to possible reasons behind gender bias in technology related fields, which is often caused by admonishment. We encounter this scenario when gender differences are coming from family as mentioned by Oyenronke Oyewumi [8].

Recent work presented by Jill P. Diamond et al. [13] illustrates other factors that create technology-divide among women caused by using technology to abuse vulnerability of women. This weakness comes either from the existing differences of women spending less time with technology compared to their male counterparts or it comes from the shock felt after some form of harassment. This scenario is present in

Bangladesh as well, where we find technology used to harass college going girls who are considered to be advanced technology users of their generation. Such a shock has serious ramifications, where the girl tends to evade certain mediums of technology in fear of the harassment being reverberated.

Shaowen Bardzell [3] lays down a category of work referred to Feminist HCI, where economic, political, social and psychological oppression of women are discussed. Francesca Bray [46] portrays a vivid picture of gender and technology along with the social perspective. Judy Wajcman [45] discusses how gender issues merge with technology representation. Sherry Turkle reaches further backward in time to find out social models that cause women to have a fear against technology.

Exploring Problem Space

Exploring the problem involved working with undergraduate students enrolled in Computer Science, Computer Science and Engineering (a popular choice in Bangladesh) disciplines; reaching out to faculty members of same field to understand the problem.

Method

The qualitative studies involved small group discussions of three to eight participants in a semi-formal setup. The discussion involved female-only discussion of the same institute, female-only faculty discussion of the same sort. Later, there were mixed gender student groups from various ECE departments in Dhaka city along with mixed institution faculty members. We have considered two public universities and three private universities here. We arranged food and beverage and participants volunteered to join when contacted

through social media, emails and often phone calls (mostly for faculty members).

Major Findings Predefined Social Concepts: There are preconceived notions regarding the poor performance of a female student among faculty, instructors or peers who have direct or indirect performance implications. It is visible in the way equipment is handed over to a female student (with hesitation), as a male student is often considered better at handling equipment than female students. A female student from Computer Science and Engineering department shared her experience in a female-only group conversation:

Once a boy took some help in his assignment (programming assignment) from me but the teacher thought the boy helped me.

Hesitation to Ask: The problem exacerbates through the silence of female students who do not ask questions even if she faces problems. The reason is social and cultural where girls are expected to be shy and timid [17].

Unfair Advantages: It has been repeatedly discussed that female students often take advantage, showing weakness as their selling point.

Supporting Missing Daughters

Exploring the problem involved working with

We focused on reaching out to various groups of women – all at different education institutes across the country. We have explored the existing volunteer network that work for mathematics Olympiad, science

outreach and the events were supported by BDOSN (Bangladesh Open Source Network).

Active and Passive Participatory Events: We arranged different kinds of events consisting of career talks, open houses involving *passive participation* of students; there were programming camps and programming competitions involving *active participation* of students. We wanted to continue both in parallel as passive participants may later join the ones required active participation and vice versa.

There is a difference in *arranging active events vs. passive* ones. In passive learning based events – the major focus is on the speakers, guests and in most cases; it is a day long or half day event. The events requiring passive participation involves discussions, talks and speeches followed by questions and answer sessions. We have to consider the availability, logistics (e.g., availability of direct flights to the region or road connectivity etc.) of the guests for a day. The number of events requiring passive participation arranged this year (2017) up to May, is shown in Figure 1 and one particular event as an example is highlighted in Figure 2. On the other hand, events requiring active participation consist of events where students are learning particular skills or computing (e.g., a new programming technique, a new language etc.). The active learning based events require programming mentors, set of questions and computer laboratories to conduct sessions of practice or competition. We have received the computer laboratory support from local Universities. However, programming mentors scarcity was a problem and female programming mentors, who could also act as role models, were limited. We have presented the number of programming related activities

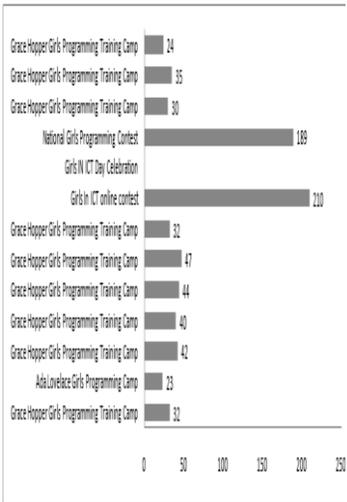


Figure 3. Programming Events in 2017 that required Active Participation



Figure 4. National Girls Programming Contest Winner Team, 2016

that took place in the year of 2017 so far in Figure 3 and the winners of National Girls Programming Contest (NGPC) of 2016 in Figure 4.

We have arranged a recent programming contest in February 2018 where all the female students participated. We present the division wise participation ratio in each region in Figure 5 and Figure 6.

Training: We have arranged *mentor's workshop* and training to address the problem of mentors scarcity – there were residential camps, short term camps initiated in Dhaka and later conducted in various different localities.

We reached out towards role models from Bangladesh who are studying abroad or working abroad for support with various skill sets. Bristi Sikder, a computer science student at MIT (Massachusetts Institute of Technology) conducted an algorithm and programming workshop during her visit to Bangladesh in her summer breaks which is a notable one that inspired many students. The volunteer support is a key element to the Missing Daughter Initiative.

Aspiration and Role Models: We have arranged *visits to local software companies* that would allow participants to reach out, explore and dream about opportunities ahead. Each visit introduced group of visitors to various working teams within a firm. Unfortunately, arranging the software firm visits were easier than getting interested female participants to visit them. We had to send out multiple emails, phone calls to ask female students to join the visit and at the end, the number of visitors were lower than the promised number of participants.

We can see that there are areas to work on along with providing supporting infrastructure. We share our findings in the discussion section.

Discussion

We have observed several challenges and opportunities through the series of events to support the women of interest. We discuss them briefly here:

Individual Impact: A team to continuously inspire each other is a way to continue the positive effort. Sometimes the weekend practice sessions take long hours and often parents are not happy for an extra-curricular activity. In her words:

I had to motivate myself often. When I saw my peers practicing hard, I again felt like working harder.

Coming out of Comfort Zone: There is an ongoing inertia to come out of comfort zone.

Impact of Inspiration: A participant shared her view in an event arranged in Chittagong,

When I listen to talks, I feel good – later, I become normal again (it goes away)!

Financial Support: There is a general *misconception that arranging events require great amount of funding*. The volunteer activities to support positive initiatives are the major driving force of the project.

Mentoring and Recursive Impact: There is the mentoring and its recursive positive impact (that impacts the mentor itself) of giving one back. In a mentors workshop event, one mentor shared his story

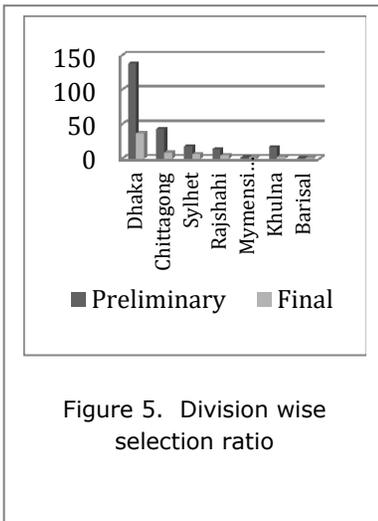


Figure 5. Division wise selection ratio

as: *I was neglected (looked down upon) as I was out of Dhaka, from a small town. It was hard for me to learn programming but I was very eager to learn. Once I learned a bit, I wanted to teach others so that they would never face the humiliation I faced. It was slow initially, but now we have waiting list of people who want to learn programming since we did well in NGPC. My 10 year old niece also learns programming and I heard her explaining loop to someone else in her own words,*

Loop is like a train that keeps going and going. But once the fuel is gone, it stops!

So I understood that teaching others is the best way to learn.

The positive force flows from participants to mentors:

I never realized, I had these leadership skills.

It is evident that the entire outreach process enables a team work, individual effort – which keeps working on its own once the initial barrier is broken working like a positive chain reaction.

Conclusion

We have looked at the ongoing gender based technology divide and presented a voluntary driven initiative named the Missing Daughter Initiative that focuses on supporting young women in the field of Computing. We initiated our work by understanding the problem and identifying key issues. It was evident that there are existing problems and awareness generation is one of the major factors to engage young women. At the same time there should be skill development which

is the key to improve confidence. The entire volunteer driven process has created a positive impact on the volunteers, mentors and participants as a team as well as individuals.

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