Structured Training as an Enabler for Women in ICT: A Case Study from Bangladesh

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Abstract—Gender gap in technology and workspace has gained attention in recent years. Different initiatives have been taken to engage women in technology learning and usage space to prepare women for the workspace. This study looks at the three year-long initiative a particular voluntary organization has taken to engage, and train women all across Bangladesh. This impact study involves n=30 participants who joined the activities of the organization through focus group discussions and one-to-one interviews. The participants shared that these events have boosted their confidence and enhanced their skills and networking in their relevant fields. The findings demonstrate that structured learning helped women develop skills and resources required to transition into professional life. The study contributes to the existing literature by providing insights on the potential of such initiatives to increase women's participation in ICT in the context of Bangladesh where women have limited access to technology.

Keywords—Women in ICT, STEM, Skill Development, Structure Training, Women in Bangladesh

I. INTRODUCTION

The women in South Asian regions have limited access to technology usage [18]. Also, lack of technology familiarity negatively impacts the experiences of using technology as women are more prone to abuse on various technology platforms [31, 32]. Recent studies have emphasized ways to improve and engage women more in technology learning and exploration in this region that reflect the socio-cultural values and norms [33-37]. In the learning domain, studies have shown how female learners in the technology field were constrained by various social and cultural norms in Bangladesh [36, 37]. Regarding women using technology platforms, there are similar barriers for women, as seen for women from Afghanistan [34], India, Pakistan, and Bangladesh [31, 32]. This work focuses on understanding the specific initiatives of engaging women in technology learning and usage space that has taken place in Bangladesh studied by the *Aparajita project* through an initiative by Bangladesh Open Source Network (BdOSN) [30].

The Aparajita project is named after a Bangla word that means the one who cannot be defeated. It looks at the three year-long initiative BdOSN has taken to engage, and train women all across Bangladesh. It considers an academic skill development unit which conducts a yearly national level programming contest named the National Girls Programming Contest (NGPC) which takes place once a year where participants join through a preliminary qualification round online. The goal of this contest is to engage the female students in competitive programming practices where the number of female representation has been low [36, 37]. The other initiative takes place to engage the entrepreneur community through a formal training process that trains the community all across the country through Anisul Haque Cohort (AHC) through a series of classes, practical sessions over several camps, and learning processes. Apart from these initiatives, the three year-long initiative conducted an annual conference for women connected to technology that included a series of workshops and discussion sessions working as a networking event named Ada Lovelace Celebration for Women in ICT [38]. This work engages in a qualitative study that has covered n = 30 participants from NGPC and AHC through focus group discussions and one-to-one interviews that shares the impact of the initiatives along with ideas on how to improve the ongoing effort. We found that exposure to these events has helped our participants with their networking with other females in ICT and entrepreneurship. The participants mentioned that these events have boosted their confidence and enhanced their skills in their relevant fields. The study sheds light on the potential of such initiatives to increase women's participation in ICT.

II. RELATED WORK

Bangladesh has shown a consistent pattern of feminization of poverty [15; 16]. Women confront a variety of oppressions, including high rates of illiteracy, early and forced marriage, high maternal mortality, social and religious constraints, torture, abandonment, restricted wealth control, and limited career prospects. Male guardianship is required for economic and social security, social prestige, and even

identity [17] due to societal, cultural, and religious traditions. Much of the gender divide in rural regions is due to religion and custom; with Muslims accounting for 88.3 percent of the population, women face impediments to their travel outside their house [10]. They are more likely to be limited to working on low-value, conventional items that may be sold on a small scale from home. The UNDP Gender Inequality Index (GII) rated Bangladesh 112th out of 145 countries in 2011 [18]. This gender-based inequalities negatively impact on the female education in Bangladesh. However, a study by Raynor et al. acknowledged some positive impacts of subsidized female education programs, demonstrating a low impact level [12]. Among guardians, female opinions regarding decisions about their marriage were not considered important in nearly 70% of cases [10]. Only 3% considered declining to give dowry, and only 4% of head teachers and guardians felt that girls should be able to move freely alone [10]. Moreover, small increases in income are associated with heavy household workloads and accompanying health costs. The aim of empowerment becomes subsumed under the concern for alleviating income poverty [14].

A study in Egypt shows that the ICT ownership index significantly impacts women's empowerment [26]. ICT also helps to reduce the gender gap. Teleworking, call centers, the software industry, and offshore services are encouraging more IT education and training at all education levels, encouraging girls and women to become active contributors to the Egyptian Economy's growth and development [26]. SDG #5 emphasizes the increased use of technology, particularly ICTs, to support women's empowerment. Due to such guidelines, we have yet to witness any meaningful gender-streamlining of ICT policy in Bangladesh. On the other hand, families in Bangladesh were less secure about women using ICT, worrying that they would use it to interact with strangers [25], which works as a barrier to women's ICT learning.

The formal strategy for "Digital Bangladesh," a contemporary ICT effort, was designed and promoted by the current government of Bangladesh in 2008 [1]. National initiatives on integrating ICTs (infrastructure development and service delivery) with vital socio-economic sectors such as education, health, agriculture, and law enforcement are included in this strategy. There are action plans in place for all of the emphasized domains in the Digital Bangladesh initiative, which will assist the government in achieving its stated objectives. Gender, equal access, and gender-friendly content production were all included in Digital Bangladesh-inspired plans and working goals [20]. Those remarks, unfortunately, were not backed up by concrete action plans with defined time dates and/or emphasis areas. Different ministries prefer to adopt initiatives based on their own goals, and their efforts are rarely coordinated. The ICT division has announced its plans to develop mobile training laboratories to teach 50,000 women [21]. According to recent research, training centers greatly influence women's computer adoption [23]. However, no concrete strategies have yet been developed to address issues such as specific training and the amount of ICT integration, among other things. The lack of suitable ICT policies to promote a gender-friendly environment surrounding technology pushes us to reconsider

the link between gender and ICT in Bangladesh and other developing world contexts.

In Bangladesh, women were formerly primarily considered for domestic duties and were left out of the mainstream of growth [27]. The scenario has changed with the advent of ICT; this conservative outlook about women is diminishing gradually. As a result, more women are employed in various knowledge-based industries such as computer-aided designing, graphic designing, composing, etc. [10]. With this growing number of women employed, the job environment is becoming more convenient and friendly for women. The provisions for ladies' common room, green room, etc., are considered a necessity. This changed scenario indicates a positive attitude towards women's employment.

Access to knowledge on economic and income-earning options has increased overall living standards [24]. Laws and regulations in Bangladesh are insufficiently rigorous to address gender-based violence, marginalization, and unfairness successfully. When they do exist, they aren't always followed. Any pragmatic project must, as a result, lessen reliance on government-provided infrastructure and approach technology design, usage, and involvement from a social and cultural perspective [22]. Recent research suggests that the system design should be particularly location and ecologically sensitive to ensure the effectiveness of solution-oriented ICT systems. It also requires executing a pilot run before implementation to fully address context-specific concerns and incorporate them into system design through trial and error [28]. This research explores the impact of ICT training on women in the context of Bangladesh, which helps in their development, growth, and empowerment

III. Methodology

A. Participants Recruitment Process

We conducted an in-depth qualitative study in a semi-structured format exploring how women-centric training impacted their career and how to improve the ongoing efforts. For this qualitative study we recruit n=30 participants, where n=24 undergraduate female students and n=6 female entrepreneurs who already have small and medium businesses. This study considers several university students from Bangladesh's different divisions (Dhaka, Rajshahi, Khulna). The participants connected with Information Communication Technology (ICT) and had IT, robotics, programming, and employment readiness training. As it is a impact analysis study the participants selected are mostly completed their training 1.5 to 2 years prior the research. The participant recruitment process was assisted by BdOSN [30], as they have a database of the trainee participants.

BdOSN is a non-profit, voluntary organization with a 16-years track record of planning and implementing nationwide projects targeting young girls, youth and women related to STEM (Science, Technology, Engineering and Mathematics) education, ICT skills and capacity building and entrepreneurial development initiatives [30].

BdOSN has taken 3.5 years long initiative to engage, The activities under the project focused on two major aspects as Capacity enhancement and Entrepreneurship Development. Capacity Enhancement consist of Soft Skills (e.g.,

programming camp, ICT camp), Career Counseling (e.g., Ada Lovelace celebration), Exposure (e.g., internship, job attachment, exposure visit, mentor workshop), Platform (GWO web portal) that helped women connecting to ICT and related fields. Along with that, entrepreneurship development consists of Girls Innovation Residential Bootcamp (e.g., idea pitching, teamwork, business model canvas development, business case study) and Grant Mentorship (e.g., connecting entrepreneurs with investors, mentoring from established entrepreneurs).

B. Discussion Method and Study Moderation

Considering the COVID-19 pandemic, we asked participants about their preferred mode of discussion - online or offline (in-person FGD). Prioritizing the participants' utmost comfort zone, we conduct 6 focus group discussions (FGD) consisting of 4-5 participants following the concept of a mini focus group [3, 4], where 2 interviews are conducted offline. In addition, we conduct 4 one-to-one interviews depending on the availability of the participants. All the one-to-one interviews were online and conducted with the entrepreneurs at their preferred time.

The FGDs were conducted in Bengali, the native language of the participants and the researchers. Each FGD took around 1.5 hours to complete, consisting of 10 questions and follow-up questions based on their responses; sample questions added in the appendix section. We asked participants open-ended questions allowing discussion and storytelling instead of a straightforward, structured question-answer format. The questionnaire helped us to guide the conversation toward the research objective [9]. Participant recruitment followed the purposive sampling method [5, 6]. The research team was present at all the interviews, where one of the researchers started the discussion while the others took notes and assisted in asking follow-up questions.

C. Qualitative Content Analysis

All the discussions conducted in the Bangla language were transcribed and translated into English from audio records of the interviews for further coding analysis. We followed inductive content analysis in the coding phase, starting with open coding [7, 8] by using Atlas.Ti software [29] where all the researchers cooperate. After multiple rounds of coding analysis, we generated affinity diagrams for grouping and categorizing the major codes after several discussions among researchers were able to identify the key themes from the findings.

D. Research Ethics and Safety protocols

The institutional review board approved this research (BRF/ERB/2022/001). Each participant in the qualitative study received a gift equivalent to BDT 1000 (11 USD).

We maintained appropriate social distancing and safety guidelines provided by the WHO [2] and the Ministry of Health, Bangladesh [13] for conducting the interview sessions.

IV. FINDINGS

The study findings show an overarching demonstration on how the practice and training sessions have helped the participants to transition better towards their professional lives. Some of the events are shared in Figure 1 presenting events organized by BdOSN.

A. Networking

The participants unanimously shared about their networking opportunities which are challenging for female participants, particularly, the ones living outside the capital. The advantage of networking opportunities were enthusiastically shared by participants engaged in entrepreneurship as one shared how she found her business partner from one of the workshops she has attended.

Fig. 1. Female students participating in initiatives organized by BdOSN (Left) NGPC 2022 (Right) Seminar organized by BdOSN

"I got acquainted with another entrepreneur through BdOSN. I partnered with her and now have a shop in Aziz Supermarket."-P29, Entrepreneur.

Another participant shared about receiving new business orders through the networking opportunities. Girls who regularly participated in programming contests mentioned that these events helped them build a community of female coders as they got acquainted with others participating in the same event. Another participant stated that she was a final-year student who didn't know how to connect with others since she aspired to be an entrepreneur. When she attended the girls innovation bootcamp, she met new people and created a team.

However, few participants joining from outside the capital suggested local events to be organized in other cities and suburban regions where smaller communities would benefit within that locality.

B. Confidence Enhancement and Pressure Handling

The participants shared that the competition and training sessions helped to build confidence among them. Moreover, solving problems within time constraints challenged their capabilities, teaching them to work under pressure. An entrepreneur mentioned seeing other women fighting for their dreams in itself was inspiring for her. The bootcamp she attended gave her the mental strength to face various challenges in her entrepreneurial journey. The students appreciated the opportunity to come forth and compete with others at a national platform. As one student mentioned, participating in these events made her feel that she is ready to tackle more difficult challenges. Another student shared how attending one of the training sessions pulled her out of a difficult point in her life instilling confidence and positive thinking.

"A lot of confidence grew up in me. The 1st year of my undergraduate was traumatic. All of my positive energy had reached the bottom. I am accepted by the people, this thought had left me. I was going through frustration. The bootcamp worked as a fuel to develop my confidence and positive thinking."- P2, DU Student.

One of the participants, a student, said she had never worked so intensively before the datathon in terms of managing pressure. She explained how she developed skills for addressing time-constrained work pressure. She continued by saying that she had never worked in this manner while a student.

"You need to submit your work within 2 hours in the datathon contest. It's not like that you have one week for this and you can work and relax. I didn't work before under pressure like I have done there. This competition helped me to cope up with pressure handling"-P5, DU Student.

The participants shared about how the training has introduced them to challenges and improved their level of confidence and ability to handle pressure. However, another student participant shared that when they join a programming contest (NGPC), they have to maintain their class time and exam schedule with the contest. She suggested that alignment of the contest and academic schedule can enhance their opportunity of competing in these programming competitions.

C. Skill Development

In our study we found that the training programs and workshops helped a lot to develop participants' skills as students and entrepreneurs. These skills helped the student participants for job placement after their graduations and entrepreneurs to extend their business and develop business models. A participant joining an entrepreneur workshop being a student of engineering herself shared how the training enabled her to develop a better understanding of the business model which she was not familiar with before.

"I learned a lot there because I wanted to make my idea a reality. I am an engineering student, and my business-related ideas are very limited. Through these 3 days of bootcamp I learned a lot of new things that I needed to know." -P19, Student.

Another participant who is a student stated that she comes from a very conservative home and was never permitted to perform collaborative activities while staying with friends, but by participating in bootcamp, she learned how to do teamwork, which helped her significantly. A participant who is an entrepreneur shared that the workshop she attended covered fund-raising skill, fund management, team management and product branding knowledge which helped her in the journey of entrepreneurship.

It was clear from the study findings that the guided training helped the participants to gain a better understanding.

V. Discussion

Our findings show evidence that attending training and practice sessions for skills development has a positive effect on preparing women for their professional field. This is significant in the context of Bangladesh considering that only 34% of the working age women population is employed [19]. When it comes to ICT the participation of women is more limited, making it difficult for the females who are trying to enter this sector. The scenario is similar for entrepreneurship as well. Finding women of the same field is a challenge for the women looking to participate in different activities or while starting a business. Events that are open to all female entrepreneurs or engineers bring them together and improve their connectivity and networking. It gives them the opportunity to seek advice from experts from relevant fields. The events provide the women opportunities to interact with other female professions in the same industry, often forming a synergic relationship, as was the case of one of our female participants. Moreover, it leads to the participants sympathizing with each other and identifying role models within their professional field. Our study participants have acknowledged how the stories of these role models inspired them and helped them to envision their career. It is important to note that the role models were more acceptable to the participants because they could relate to their perspectives [36].

The regular arrangements of events, workshops and competitions to facilitate and highlight women's participation in ICT provides the women with the chance to make their place both professionally and socially. Our participants who were regulars at competitive programming created their own programming community for girls. The community extends beyond the group of contestants and includes aspiring female programmers from their university. As a result, the programs benefited a larger group of women who were not directly connected to the events. The potential of enhancing confidence among women regarding ICT and entrepreneurship was prominent in the discussions with our participants. Although the events were open for all female participants, the activities being centered towards the capital made attendance challenging for women living outside Dhaka city. This leaves the scope to make the programs more effective by expanding the events in the other parts of the country as well. The expansion in the divisions other than Dhaka would give the female living in those areas a chance to participate which will subsequently open up better opportunities to flourish themselves in ICT and entrepreneurship. Moreover, aspiring students will be able to better plan their studies and exam around the events if competitions (e.g., programming contest, datathon) have a set annual timetable. In order to minimize scheduling conflicts between important exams and contests, they can look for institutional support.

VI. Conclusion

The advent of ICT and emphasis on gender equality has put a lot of attention on reducing the gender gap in technology and workspace by educating and building skills women need to enter into professions. This research on n = 30 women explores how learning programs designed for women have impacted those who have participated. Our work demonstrates that structured learning helped women develop skills and resources required to transition into professional life. Given the socio-cultural scenario of the country and the small percentage of women participating in workspace, women have very limited scope to connect with others in the same field. The training sessions and competitions serve both as a networking and skill development platform for women in ICT and entrepreneurship. The networking opportunity allows expansion in their profession while skills development improves their personal competencies. In addition, the study shows that participation in workshops and events instills positivity among the women, enhancing their confidence and ability to perform under stress. The experiences shared by the

participants sheds a ray of hope towards engaging more women in ICT and entrepreneurial initiatives.

ACKNOWLEDGEMENT

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APPENDIX

A1. Sample Questions

1. How did you enroll in the trainings and workshops program?
   a. Please share your experience with the training in detail.
   b. In your own words please tell us if the training has impacted your daily life.
   c. What role did training have in your technology usage? Please share with us in detail.
   d. Were you able to utilize the skills acquired through the training to teach others (family members, relatives, neighbors, etc.) to use technology? Please share with us in detail.
   e. Did the knowledge acquired from the training play any role in your daily life during the COVID-19 pandemic? Please share with us in detail.
2. Did / Can the trainings and workshops have an impact on your professional career? Please share with us in detail.
3. Do you have any suggestions about the trainings and workshops? Please share your view.
   a. What steps can make the training more effective for women? Please share your views.