WIP: Social Capital and Women in Computing – A Comparative Study Between Sweden and Bangladesh

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***Abstract*—Sweden and Bangladesh, despite their geographical and cultural differences, share a characteristic of having comparatively low levels of women's involvement in computing education and careers. In order to broaden participation in the field, it is fundamental to understand the social and cultural factors which contribute to this issue. By using Bourdieu's conceptualisation of social capital, this work in progress research paper investigates how social connections serve as a resource for support and opportunities for women in computing education. Through semi-structured interviews with 12 female students from Sweden and Bangladesh, this study identifies themes about friends, family, and outside influences. The thematic analysis reveals similarities and differences in family relationships, as well as patterns of support and discouragement, observed in the two groups. The findings underscore the significance of family support in Bangladesh, particularly about career prospects, whereas Swedish families demonstrate a favourable perception of education. Friendships have a substantial impact in both groups, affecting the degree of support and discouragement. In addition, the students reflect on external influences, such as teachers and role models, in shaping their decision of studying computing. Acknowledging sample size limitations, the study offers insights into how access to social capital influences women's educational choices in computing in Sweden and Bangladesh. Future work should build on these findings and further investigate the interplay between social and cultural factors on participation in computing education. A recommended follow-up study would involve survey research based on the findings presented here, in order to quantify and validate the trends identified in the interviews. In addition, assessing the themes in a broader population would enhance the external validity of the study. Ultimately, the goal of such research efforts is to broaden participation in computing, by developing an understanding of social and cultural factors that affect women participation in the field.**

***Index Terms*—Broadening participation, women, social capital, computing education**

I. Introduction

Computing education has traditionally been characterised by low levels of participation and diversity, in particular when it comes to female students [1]. While this is a global phenomenon, country-level differences exist, suggesting that social and environmental factors play a crucial role in women's participation in the field [2]. With this in mind, this work in progress research paper sets out to understand the social and cultural factors that drive women's participation in computing among two geographical and culturally distinct countries, both facing challenges with computing education participation. This paper addresses gender imbalances in computing through the lens of social capital theory [3], suggesting that social networks play a significant influence on choice of study, and that this effect is mediated through culture. The findings underscore the significance of family support in Bangladesh, particularly about career prospects, whereas Swedish families demonstrate a favourable perception of education. Friendships have a substantial impact in both groups, affecting the degree of support and discouragement. In addition, the students reflect on external influences, such as teachers and role models, in shaping their decision of studying computing. Based on the findings presented here, future work will involve an additional survey and a larger sample size, in order to validate the findings presented here, and to enhance the representation of the sample with regards to the population. Ultimately, the goal of these research efforts is to broaden participation in computing, by developing an understanding of social and cultural factors that affect women participation in the field.

II. Background

Over the past years, Bangladesh has witnessed a transformation in the landscape of computing education and careers, demonstrating its dedication to technological progress and digital transformation [4], [5]. Still, the current quantity of educational institutions in Bangladesh is inadequate to fulfil the growing need for computing professionals [6]. While computing is becoming one of the most promising fields with favourable career prospects in Bangladesh [7], students encounter challenges in participating in computing education and related occupations, particularly due to socioeconomic challenges and gender imbalances [8], [9]. In Sweden, on the other hand, while there is a strong commitment to promoting equal development of digital skills throughout diverse demographic and socioeconomic groups [10], there are still

disparities in participation in computing education, especially when considering gender [2].

III. Related work

Previous research has highlighted a number of cultural and social explanations for why female students engage with computing education, including social support [11] and perceptions of role models [12]. Other educational research emphasises the family spillover effect, which suggests that the choice of study of parents and siblings plays a significant role in educational decision making [13]. Similarly, social capital theory posits that social networks and relationships are valuable resources that shape individuals' educational participation and choice of study [3]. In computing education, social capital has been identified as a contributing factor to participation [14]–[16], for example when it comes to social influence from friends [17]. The relationship between access to social capital and choice of study is illustrated Fig. 1.

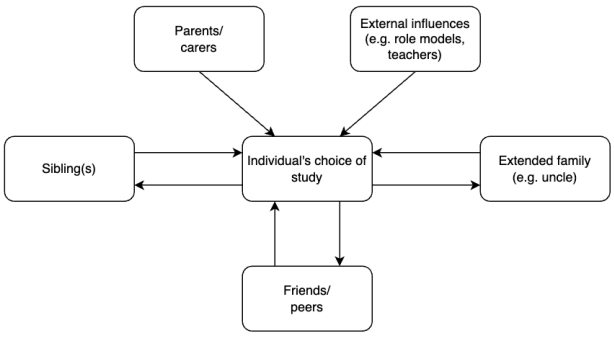

Fig. 1. Social capital and choice of study

IV. Methodology

A. Context

This study involved two large-scale universities in Sweden and Bangladesh, namely Uppsala University and Noakhali Science and Technology University. These universities were considered a suiting research environment for the current study as they offer various degrees in computing, and recruit a wide variety of students. The sample consisted of 12 female computing students, 5 from Sweden, and 7 from Bangladesh.

B. Research design

The research design consisted of semi-structured interviews and thematic analysis. The semi-structured interview approach is particularly suited when the themes of interest are defined beforehand, while allowing for unexpected insights to emerge during the research process [18]. In the context of this study, it meant that the focus of the interviews was on family, friends, and other social connections which can influence an individual to study computing. Once the draft interview guide was complete, it was shared with an expert in the field, who then proceeded to make sure that the questions were appropriate, devoid of ambiguity, and captured the essence of the themes. Before conducting the interviews, consent was obtained from the participating students by e-mailing them a consent form. The interviews were conducted through Zoom video conversations and in person, and lasted between 15 to 20 minutes. The interview guide and research instrument guidelines can be found in a supplementing report [19].

C. Thematic Analysis

Once the interviews had been conducted, a thematic data analysis method was chosen because the primary goal was to explore the predefined themes, and to identify new patterns within the data [20]. During this phase, the researchers would carefully examine the transcriptions and, through an iterative process, establish an agreement on a specific set of codes. A code is a word or phrase that is assigned to categorise a passage of text by a topic. Examples of codes include "career opportunities" and "family views towards computing". The codes were then used to mark passages of text, and counted to identify which codes are most representative of a subtheme or theme. Researchers would convene regularly to discuss the coding process and to achieve an agreement on the interpretation of the data. The data analysis process can be described in a sequential order:

$$\text{Theme} \rightarrow \text{Question(s)} \rightarrow \text{Codes} \rightarrow \text{Code count} \rightarrow \text{Group comparison} \rightarrow \text{Interpretation} \rightarrow \text{Report}$$

The themes and subthemes themes which emerged during the data analysis are visualised in Fig. 2.

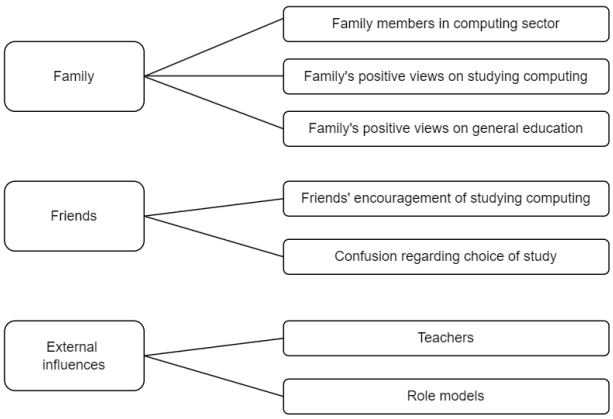

Fig. 2. Overview of themes identified by thematic analysis

V. Findings

A. Family

As for the theme family, both groups of students reflected on the influence of *Family members in the computing sector*. For Bangladeshi students, the subtheme *Family's positive view of studying computing* was prominent, and the subtheme *Family's positive view on general education* was more common among the Swedish cohort.

1) Family members in the computing sector: Family members in the computing sector was a subtheme recognised for both Bangladeshi and Swedish students. Four out of seven Bangladeshi students had at least one family member who had studied a computing-related subject, and these family members also worked in the field. Three out of five Swedish students had a family member who had studied the subject, however all students had family members who were working in or had worked in the computing field. While this was a common theme among respondents from both groups, the nature of the familial influence differed, which is outlined in the subthemes below.

2) Family's positive views on studying computing: Among the Bangladeshi students, there was a common subtheme in regards to encouragement, namely that family had a positive view of studying computing. Four out of seven students noted that they were encouraged by their family members to study the subject.

> B4: "He said, If I want to study engineering, then computer science would be a good fit for me. And he likes this too. Because my cousin also studied here."

The Bangladeshi students were encouraged by their family members for a variety of reasons, including the demand and opportunities in the computing field, career prospects, and high salary.

> B2: "My parents thought that regarding job opportunities if I studied computer science, I could work in all sectors like banking, teaching that's why they encouraged me."

Another common topic of encouragement among the students was computing as an acceptable alternative career path. Four out of seven of the Bangladeshi students had initially been encouraged or expected to pursue some sort of medical degree, but when presented with computing as an alternative the family members had either encouraged the choice or not discouraged it.

> B4: "Most of the parents in Bangladesh want their daughter to be either doctor or an engineer. So if their daughter isn't becoming a doctor then an engineer is a pretty good choice."

3) Family's positive views on general education: While the family members of Bangladeshi students would encourage computing education, for three out of five Swedish students this encouragement would not be strictly confined to computing, but rather be an overarching encouragement of furthering education in one way or another. One student described encouragement for technical educations, yet not specifically computing.

> S4 : "Primarily to pursue some university education, that was it, and then the technical aspect was more from my dad. But not that it would be IT; I think most were quite surprised that it turned out to be IT."

For the other two students who were encouraged for specifically computing subjects, one mentions that it was not a condition for the family members support, even though the student can recall at a young age being encouraged to attend events that encouraged studying such subjects.

> S1: "Uh, yes, not more encouragement than for any other education. I was also a bit interested in pursuing a music education, and they thought that was fun too... back then, my elementary school had an opportunity for girls, where girls could visit various companies and explore engineering professions. My parents were 100% in favour of me attending, especially my dad. He thought, "Of course, you should go to that.""

The other student who was encouraged to pursue computing education described a sense of caution, and also time needed for the interest to develop.

> S2: "Well, initially when my dad suggested it around the age of 16, it was because he likes that field, finds it very interesting. And, like everyone else, he perceives that there are few girls in the industry. So, he presented it a bit cautiously"

B. Friends

For the theme Friends, both groups of students reflected on *Friends encouraging studying computing*. For the Swedish students, an additional subtheme was identified, namely *Confusion regarding choice of education*. Five out of seven Bangladeshi students had friends who had studied or were studying computing, but none that were working in the field. Two out of five Swedish students had friends who had studied or were studying the subject, and only one had an acquaintance working in the field.

1) Friends' encouragement of studying computing: Four out of seven Bangladeshi students were encouraged to study computing by their friends, with secure job opportunities and merit rank mentioned as words of encouragement. Merit rank in the Bangladeshi public university system refers to a prerequisite for studying a subject in university. Three out of five Swedish students had been encouraged to study computing by their friends, and from these two of the students' friends had used monetary reasons for encouragement.

> S1: "We were checking if we should pursue further studies, considering the salaries, and that this program would provide a better future path."

2) Confusion regarding choice of study: In addition to the encouragement as shown by the friends in both student groups, there was also a sense of confusion among three out of five Swedish students' friends.

> S2: "Some have been very shocked or surprised in a strange way, I think, not discouraged, more like, why, what are you doing?"

C. External influences

The students also mentioned social influences that were not related to the main themes of family or friends. Three

out of seven Bangladeshi students had been influenced by others outside of the aforementioned people, such as peers' career opportunities. One student mentioned the influence of media, specifically an autobiography of a role model that had influenced her choice in education.

> B1: "An autobiography of Alan Turing. and that kind of really intrigued me that this field of computing and algorithms is interesting... And this movie inspired me a lot in this field that this degree can help in future times"

When it came to the Swedish students, all five mentioned external influence on choice of study. Three mentioned teacher influence, one through discouragement of the other path that the student had aspired toward, while the others spoke of their teacher showing a general passion for the subject and providing an enjoyable subject experience.

> S3: "It was more that he was so enthusiastic about the tech thing and was very encouraging, just encouraging us to continue and develop, and so on."

Two Swedish students mentioned inspirational role models. One of them had attended multiple inspirational lectures from women in the industry. The other student was more general, describing the inspiration from women in a male dominated field acting as influence.

> S2: "It might not be a specific person who motivated me, but I am motivated by women in the industry in general, and in several different fields working in male-dominated professions, to kind of stand up for us"

VI. Discussion

This work in progress research paper delved into the social dynamics surrounding women choosing computing education, providing a foundational base for further investigation. In line with social capital theory, this research showed that social networks and relationships are valuable resources that shape individuals' educational participation and choice of study [3]. For the students in Bangladesh, the majority had family members with connections to the computing industry, whether through work or education, as well as friends studying the subject. When it came to encouragement, their family played a significant role emphasising the favourable career opportunities for computing. For the students in Sweden, all family members had connections to the computing industry. They were encouraged to continue their higher education, but were not specifically encouraged to study computing. This research also highlighted the significance of role models and teachers in shaping student perceptions of the field, falling in line with previous research [12]. From a culturally-responsive pedagogy, this calls for an understanding that students engage with computing education for a variety of social and cultural reasons, and that this should be taken into consideration in pedagogical design and classroom settings [21].

VII. Limitations and future work

While this research examined the role of social capital among women choosing computing, it is important to recognise that social perceptions and attitudes towards computing, as well as the role of women in the field, can be explained by a variety of social and cultural factors. Expanding upon this, a deeper analysis of the cultural aspects would be an option, exploring the intricacies of relationship structures in the different countries and assessing their potential impact on the outcomes of this study. One approach is to use the interview guide as developed for this research [19], and the thematic analysis approach as described in the research paper, to further study women in computing across cultural contexts. This also leads the researchers to acknowledge the sample size limitations for this work in progress research paper. At the time of writing, a survey as developed in another research paper [17], is being used to further investigate the social and cultural factors underlying participation among Swedish and Bangladeshi students. The goal of the study is to further delve into the findings as presented in this paper here, while increasing the sample size and representation of the sample with regards to the student population.

VIII. Conclusion

The lack of women in computing education and careers is a global phenomenon, with social and cultural factors contributing to the issue [2]. In order to broaden participation in the field, it is fundamental to understand the social and cultural factors which underlie student participation. By using Bourdieu's conceptualisation of social capital, this work in progress research paper investigated how social connections serve as a resource for support and opportunities for women in computing education. This study revealed the role of family, friends, and external influences that shaped the educational and career paths of female computing students in Bangladesh and Sweden. The findings underscore the significance of family support in Bangladesh, particularly about career prospects, whereas Swedish families demonstrate a favourable perception of education. Friendships have a substantial impact in both groups, affecting the degree of support and discouragement. In addition, the students reflect on external influences, such as teachers and role models, in shaping their decision towards computing. By comparing two geographic and culturally distinct countries, this research aimed to understand the various social and cultural factors that contribute to women participation in the field. Future work should build on these findings and further investigate the interplay between social and cultural factors on participation in computing education. A follow-up study is currently in progress which involves survey research based on the findings presented here, in order to quantify and validate the trends identified in the interviews. In addition, assessing the themes in a broader population would enhance the external validity of the study. Ultimately, the goal of such research efforts is to broaden participation in computing, by developing an understanding of social and cultural factors that affect women participation in the field.

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