



Bridging (Gender-Related) Barriers: A comparative study of intercultural computer clubs

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ABSTRACT

The study explores the positive impact for girls and young women from engaging in computer clubs, with regard to their vocational preparation as well as to their social empowerment. Our comparative study focuses on gender related barriers in a Palestinian refugee camp as well as an intercultural neighborhood in Germany and discusses how the computer club can contribute to overcoming these. Findings indicate a positive impact of open and collaborative working and learning structures; in Palestine and Germany alike.

Categories and Subject Descriptors

• **Human-centered computing**~**Empirical studies in collaborative and social computing** • *Human-centered computing*~*Collaborative and social computing theory, concepts and paradigms* • *Social and professional topics*~*Computational thinking*.

Keywords

Refugee Camp; Computer Clubs; Children, Gender, Barriers, Learning, Collaboration.

INTRODUCTION

In this paper, we present results from our research in two, apparently different, yet similar, marginalized areas; in which especially women are presented with equal challenges when it comes to achieving digital equality.

Although gender has earned attention with regard to the design of learning settings, methods as well as lessons' content, a significant gap between girls' and boys' participation in the computer science domain remains. Girls and young women have long been and still are underrepresented in the field of computer science. Why is this the case?

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The role of gender with regard to the appropriation of ICT in education and classroom settings has been elaborated on in several descriptive studies. Their tenor e.g. [3, 29]: female students rather unassertively approach ICT, restricting them to a users' perspective and scarcely taking up developers' or product designers' view. Researchers detect personal attachment figures to be a determining factor for learning success and career choices. Still, engagement of females as ICT professionals remains on a constant low level – so numerous studies target this issue. Again, personal factors like attachment figures or the self-assessment of skills are identified as determining factors for the choice of career paths in the IT sector. We see: reasons for the low female engagement in informatics range from the design of school subjects to the structure of study paths and professional engagement. Yet, initiatives in various countries to change the situation focus either on education or professional work in the domain [34]. Leiviskä and Siponen [18] state a long tradition of research studying the underlying reasons for girls low interest in ICT and computing in the US, Canada and Australia, whereas *'only a few studies have been carried out in Europe and in Scandinavia'* [ibid., p.35]

So, apparently it's all been said? The answer is: no. As technology is moving ever so fast ICT is transforming the ways we spend the working as well as the leisure time of our lives, the conditions of access to and appropriation of computer hardware and software are in constant flow, too. As Margolis et al. have phrased it in their study of African American and Latino/a high school students' access to computer science: *'Computing is the kind of high-status knowledge that taps a student into the grid of twenty-first century opportunities.'* [19, p.4]. The researchers place a very basic insight at the beginning of their inquiry [ibid. p. 4-5]: *'It is tempting to think that because it (computing) is a technical activity, it should be free of the biases that affect more obviously culturally situated fields...'*

It is a small step of thought to apply this assumption to matters of gender. Here too, biases are prominent, affecting the ways girls do or do not assess ICT and computer science. In the HCI community a sense for the usefulness of a focus on differences in the male and female interaction with computers has developed from research insights touching upon various disciplines; among them computer science, economics and education, marketing and psychology. Foci that have evolved cover matters of confidence [e.g. 10] and motivation [e.g. 26], different learning styles [14], and the field of gaming [15]. In 2006 the findings from the various areas were brought together in an explicit concept of gender HCI [8], acknowledging the benefit of thinking the multiple facets of the subject matter together [11].

A holistic approach that unveils possible factors affecting girls' and females' view on ICT and computer science is necessary prerequisite to broaden the narrow and exclusive share of our population learning computing techniques and skills. This approach has to be local, since the possibly influencing factors are of local nature: girls have a family background; they are enrolled in a school with certain equipment and bound to a schooling system with specific rules; they have teachers who differ in personality and educational background; they have friends whom they spend their free time with.

With the study presented here, we present the positive impact for girls and young women from engaging in computer clubs; for their vocational preparation as well as for their social empowerment. We contrast our experiences of gender related barriers in the Palestinian community with cultural gender aspects we encountered in the German neighborhood community, and then discuss how the computer club can contribute to overcoming these. We identify a positive impact of open and collaborative working and learning structures; in Palestine and Germany alike. The contribution of this paper is the description of a computer-based educational scenario, enabling especially girls and young women to make decisions about their education and career paths on a more profound, independent and self-confident basis.

STATE OF THE ART

Computer Clubhouses

Learning by designing, cultivating a community of learners, fostering respect and trust, and encouraging youth to build on their own interests were the guiding principles (set forth by MIT's Media Lab) by which the first Computer Clubhouse was established in Boston in 1993 [32]. Grounded in the fields of education, developmental and social psychology, and cognitive science, the Computer Clubhouse model has grown to a network of more than 100 active youth community learning centers across 20 countries around the world. Their impact and success is well documented in research [32, 16, 24].

Consisting of six computer clubs spread across four cities, the come_IN network in Germany is inspired by the original clubhouse concept but follows a fundamentally different approach by focusing on cross-cultural interaction between the members. Mainly located in elementary schools, the intercultural community spaces were established to foster learning, social community structures, cross-cultural understanding and respect in socially and culturally diverse neighborhoods in Germany [36, 39]. In weekly meetings, children and adults engage in self-determined project activities, making mutual learning in inter-generational and inter-cultural constellations a common ground for further interactions among participants, beyond the computer clubs' facilities and weekly sessions. Project activities increasingly involve 'maker' related technologies, such as 3D printers, for creating not only digitally but designing haptic artifacts as well [38].

Two computer clubs were established in Palestinian refugee camps [47], providing a safe place for camp inhabitants for accessing ICT and learning related skills supported by university volunteers. Thereby, also regular interactions between camp and external, usually separated, society were established, offering a vision of a life outside the camp for camp inhabitants [1].

Gender related barriers to IT appropriation and use

Gender related barriers affect women's ICT utilization in diverse contexts all over the world. Especially in marginalized areas, the

same challenges reoccur independently of a particular local context, as severe gender differences in ICT access and utilization become manifest.

The term "digital divide" was defined by Mehra et al. [23] as "the troubling gap between those who use computers and the internet and those who do not." Getting access to ICT still remains a challenge in Palestine that affects the majority of inhabitants. Aggravatingly, the digital divide between camp inhabitants and those outside is still obvious. In Germany, most people have own devices or at least could easily get access to ICT [30]. While this may be the case for male ICT users, female users are confronted with additional barriers, often attributable to cultural or religious images of women, resulting in a gender digital divide as well [42, 46].

While there is ample and seminal research investigating the positive implications of computer-supported community-based learning spaces in diverse urban and rural settings, little attention has yet been paid to contexts in which the targeted underprivileged communities are "forced" refugees living in isolated but open quasi-temporary enclaves.

To narrow the digital divide and to empower students in a refugee camp, Sawhney [35] hosted storytelling workshops over a period of three years. The young people in refugee camps have stories to tell and reflect a lot on "their identity, heritage, environment, and life experience" [ibid]. Storytelling can also be used to work through intractable conflicts; this enables people with traumatic social experiences to digest these experiences and learn to live with the events. Working with a Palestinian- Israeli group, Bar-On [5] demonstrated in a similar manner that storytelling often helps in dealing with painful events. Likewise, in <project> computer clubs, storytelling constitutes the narrative framework for the shared (computer) practice of children and adults, in difficult neighborhoods in Germany, as well in Palestinian refugee camps [45].

Asthana & Havandjian [4] conducted a hermeneutic exploration of "how young people in refugee camps in Palestine appropriate and reconfigure old and new media in the process of creating personal and social narratives. Focusing on Palestinian identity and selfhood, the project explores how and in what specific ways children and young people engage with media forms to express their ideas of politics, citizenship, and democratic participation." [2] For them [Palestinian refugee camp youth], citizenship is as much about consensus as it is about 'conflictual' engagement [25, 27]. Youth empowerment in Palestine was also addressed by Hart, exploring "the challenges of promoting the participation of children and youth in the face of immense political, physical, social and cultural constraints." [13]

The relation of gender, IT, and learning

Scientific motivation to look into the relation of girls and ICT for the most part is triggered by the statistical observation that few females engage with the IT domain. With regard to children's and youths' appropriation of computer technology, two studies assess the situation in Germany biennially [6, 28]. Here, researchers notice gender-related differences in the appropriation and usage of ICT – ranging from the choice of and access to ICT to the interests realized therewith. Researchers see computer science classes change with regard to content, methods of learning, and ICT equipment [e.g. 31, 41] – but girls' engagement remains on a constant low level [e.g. 37]. Rommes et al. [33] as well as Margolis and Fisher [19] show how at least partly this is a matter of perpetuated professional myths, describing computer science to

be 'all math', and IT professionals as 'narrowly focused, intense hackers' [20, p. 80] and nerds.

The share of women opting for a university education in the field of computer science has been low for years now [e.g. 40]. An early examination of the subject matter has been recognized to spark girls' interest in ICT. In their well-received project to 'unlock the clubhouse' at Carnegie Mellon's School of Computer Science, Fisher and Margolis successfully aimed to multiply the number of female undergraduates in Computer Science [ibid, 2002]. The researchers' success is founded on a basic insight: females are comfortable to engage with computer science and ICT if they do not feel that they must model themselves after the stereotypical male computer science student.

There are relatively few studies dealing with computer supported learning and community building under the specific conditions of Palestinian refugee camps. Wahbeh [43] analyzed a number of cases that involve students and teachers in public, private and UNRWA schools in the West Bank, including a boy's school and a girl's school in Al Amari. Wahbeh states that "*from a gender perspective, even though ICT, according to many studies, helps equalize educational opportunities between male and female students, this is far from true in Palestinian schools due to cultural values and beliefs*" as women have less opportunities for using ICT outside their home or in school [ibid].

METHOD AND DATA

The main methodological framing for our research is based on Participatory Action Research (PAR) by Kemmis & McTaggart [17, 22]: To understand the situation, infrastructure, problems and different actors, mere immersion in the field is not enough. In the case of the refugee camp, we actually had and have to engage in action and intervention (from founding the club through specific projects, workshops with potential volunteers). Researchers and student volunteers participate in the club every week as tutors to guide the weekly sessions and help with emerging problems. The German club in the focus of our study has been accompanied by a researcher and student volunteer on regular basis since its inception, documenting activities and occurrences in field notes and protocols. Their focus lies on the observable collaborations and interactions of children and adults in the club, on their appropriation of media and computer technology, and the associated processes of learning.

Methodologically alike, in Palestine, researchers and volunteers observed the sessions and wrote field notes afterwards. In virtual meetings, researchers as well as volunteers from both Palestine and Germany exchanged experiences, helping to understand the findings and frame the research question. Occasionally, researchers visited the computer clubs in the respective country to conduct workshops or interviews. During these visits, our researchers attended, observed and took part in the weekly club sessions. We collected field notes, several audio interviews with children and volunteers, digital and real artifacts (movies, presentations, 3D printed figures, games, etc.) and pictures. A native speaker carried out 13 semi-structured interviews with children from the refugee camps about the computer clubs. Additionally, feedback sheets were completed by the attending children, which were collected by the research staff afterwards. For the analysis of the qualitative data we applied a content analytic approach [21] and contrasted data from Palestine and Germany in the analysis. Overall, our analysis comprised field notes from approximately 60 sessions, as well as thirteen interview transcripts, complemented by the club participants' feedback sheets.

RESEARCH SETTING

Even though featuring a number of quite fundamental structural differences, the two places in the focus of our study hold some basic characteristics in common that allow for a fruitful comparison. We provide a detailed description in the following sections.

Al-Jalazone: A computer club in a Palestinian refugee camp in the West Bank

The West Bank refugee camps has been receiving humanitarian services over a period of sixty years, but the state of isolation, exclusion, and poverty among the refugee population is still ubiquitous. Urban Palestinians generally anticipate negative interactions with refugee camp residents due to perceived differences in behavior, morals, values, and attitudes. As a result, refugee camp spaces are regarded by many Palestinians as presumably hostile places.

A total of 59 refugee camps in the West Bank, Gaza, Syria, Jordan, and Lebanon are under the humanitarian responsibility of the United Nations Relief and Works Agency (UNRWA). Six and a half decades after its establishment as one of the temporary encampments for those who were forcefully displaced and rendered homeless during the 1949 Arab-Israeli war, Al-Jalazone refugee camp remains to this day the confined living space of some 14,500 Palestinian refugees. Located at the northern urban-rural fringe of the West Bank's city of Ramallah, Al-Jalazone refugee camp's fate is muddled in a perpetual political conflict between Palestine and Israel. Sitting on a land area of less than 0.25 square kilometers and is unable to expand, the camp is overshadowed with a long history of repeated Israeli military incursions and suffocating besiegements. Its inhabitants' daily lives under occupation - spanning three generations - are punctuated with prolonged times of suffering and systematic Israeli oppression. The camp is about 500 meters away from Beit El - a growing Israeli settlement that- according to a Peace Now report - 99% of its area stands on private Palestinian land. Strategically located on a hilltop the settlement houses around 6000 Jews giving them advantage point over the deeply marginalized Jalazone population. The security of the settlers is provided by an adjacent and active IDF military outpost. While the settlement enjoys a constant supply of potable water and a thriving micro-economy, the underserved refugees in Jalazone struggle to survive in precarious and poor living conditions - fighting against Israeli subjugation and striving for self-determination.

Exodus and harsh military occupation tales that are well articulated to depict hardship and injustice are usually part of the daily conversations of Palestinian refugees. Al-Jalazone camp residents are not different as they often express hardened feelings and bitter emotional resentment towards their grim existential fate in the camp. To foreign nationals who occasionally visit the camp and walk its narrow alleys, the popular committee for camp services - the most prominent non-state actor in the camp - will often showcase the camp's overcrowded living conditions and poor infrastructure as an exposition that delineates their long history of victimhood, human suffering, and relentless longing to obtain the "Right of Return" prerogative. A similar message is also imparted by older-generation refugees in the camp to their children and subsequent grandchildren as a natural means to preserve and pass on the collective memory of their protracted 1948 exodus and life experiences under occupation to their successive generations of refugees in hope that they will persevere and triumph even against the most overwhelming odds.

Hosted in one of the run-down rooms of the popular camp committee's administrative building, the Jalazone's computer club house opened its doors for in-camp school-aged children in May of 2012. The establishment of the computer club house came as a result of a joint cooperation project between the University of Siegen and Birzeit University. The weekly sessions in the computer club are attended of 14 children (around half of them are girls) aged between eleven to fourteen years. Volunteers from the Birzeit University, who are living in the refugee camp, support the local coordinator during the sessions (figure 1). The projects range from using scratch to create stories and games through using tools to create applications for android and electronic kits to understand circuits.



Figure 1. Children and Volunteers working together on projects in Jalazone.

Dortmund Nordstadt: A computer club in a former industrial city

The city has a history as a center of industrial production, with steel works and coal mining attracting large numbers of migrant workers from various countries - prominently among them Turkey, Spain, Portugal, and Poland - to come and work in the city in the 1960s and 1970s - at first on a temporary basis as so called guest workers, then permanently staying with their families. Together with migrants from multiple other countries around the world, they account for the city's current diversity. A large part of this culturally diverse population lives in the Nordstadt of Dortmund, a quarter with a rich diversity of nationalities, cultures and religions: 57.7% of the neighborhood population does have a migration background. The neighborhood also stands out in the city because of its high population density, large number of families, and comparatively young age structure. Unemployment in the area is high, incomes are often low, and access to higher education is often difficult. This combination of factors frequently leads to tensions in people's coexistence in the neighborhood, and resulted in the development of a profoundly bad reputation of the neighborhood as a potentially dangerous place.

The introduction of the computer club in Dortmund Nordstadt prompted immediate and lively discussion concerning the interests and individual needs of neighborhood inhabitants when the idea to the computer club was first introduced in local discussion rounds and neighborhood initiatives in summer 2009. Computer literacy was seen as important prerequisite for access to and participation in various parts of public life. The proposed computer club was expected to provide good help with regard to that matter for children and adults alike. Neighborhood inhabitants, a local non-profit organization and neighborhood

managers worked together to bring the club to life in a primary school in the center of the neighborhood. Almost every one of the 270 children in school knows two languages; one of the 20 teachers gives native-language lessons in Turkish; also the school offers Islamic and Alevi studies for the children, and provides a number of activities for parents and especially mothers – such as language classes, a “parent’s café” and bicycle trainings. In this context, the computer club developed as a stable group of participants right from the start. Curiosity for the new opportunity and the demand for participation was high, so that the club established a waiting list and has kept it ever since. The club sees seven to ten children and five to seven adults every week. Their migration backgrounds present in the club resemble the diversity of the surrounding neighborhood, with children and adults stemming from Turkey, Albania, Macedonia, Tunisia and Morocco.

FINDINGS

In our computer clubs and the surrounding communities, we saw gender-related barriers be in effect with regard to a) the access first to education and then to employment, and b) the access to and knowledge about computer technology and modern media.

Access to education and employment

Field notes from the computer club in Germany report, how women participants in the club discussed their current positions, and chatted about the career options they had or might achieve. They shared the common position that each of them had had to interrupt, delay or rethink her career because she became a mother. These mothers had discovered the computer club as a place, where the (guided) researching of working opportunities is possible, where career options are being discussed among friends and with a good cup of tea. Just like one mother, who used the club to write an application for extra-occupational academic studies, seeking feedback from her friends in the computer club, as well as help in the accurate use of language and grammar. Another woman, who ran a kiosk when she first joined the computer club, later became involved in organizational matters in school via the club work and thereby received a full-time position as a secretary after some time. A woman, who was unemployed, used the club to seek for jobs and then write applications. Also, one mother regularly used the club to practice her reading and writing skills. Several other women enjoyed the opportunity to talk in German and practice their language skills and improve their vocabulary in a comfortable atmosphere.

Fieldnotes from the computer club in Palestine report on several incidents where it became apparent that the computer club had initially established a reputation as a place where one could explore and master a variety of ICT skills, such as learn how to use different software, acquire basic programming skills as well as an understanding of computer hardware and its functioning. *"We can develop ideas. And create programs to tell stories with pictures"*, one of the girls explains what she enjoys to learn in the club. Children and adults alike made it quite clear that by offering these opportunities, the computer club served as a potential door-opener to different job and employment opportunities - in Palestine and beyond.

Access to ICT

With their project work, the computer clubs in Dortmund and Al-Jalazone alike frequently disrupted common assumptions about a) what computer technology is good for in local everyday live, and b) who can develop the skills needed to make use of it.

Several projects in the computer club history in Dortmund especially appealed to female participants, and it became apparent that this was a result of restricted access to computer technology and modern media for women and girls in some immigrant communities. Just like the "computer puzzle" project (figure 2), where women took a computer apart, learned all about its components and functioning and then built it back together again, and installed it as a "mothers-only PC" for the club. *"At home, I just never have the chance"*, one of the mothers explained her liking of the project, telling that she would always step back behind her husband and her two sons when it came to using the only PC in the household.

In Al-Jalazone, children as well as adults were seen to pay close attention to whether access to ICT as well as other club related benefits would be equally distributed among all participants. Mere access to computer technology and other club resources, and the chance to develop the skills needed for the handling thereof were seen as special benefits and would not easily be given up. This was evident in little incidents like the case of a boy who would bring his older brother to the club to make a case for him when he felt hard done-by in that he did not receive a pen of his own when pens were distributed by the tutors one day as a resource for project work in the club. As resources are scarce, they are especially valued. Tutors even bring their own ICT to the computer club in order to secure access for as many participants as possible.



Figure 2. In a "computer puzzle", women in the computer club in Dortmund explored a computer's components and functioning.

Common assumptions about who can develop the skills needed to make use of ICT were disrupted in the club in Dortmund when participants engaged in e-textiles projects, a) sewing and soldering little stuffed figures with an internal circuit with a LED that would light up when the circuit was closed [44], and b) sewing and programming monsters from fabric, with an integrated Lilypad [9]. By combining technical and building skills - often characterized as masculine hard skills - with craft skills and aesthetic skills - frequently characterized as feminine - these e-textile activities allowed and encouraged children to develop the full range of skills and not step back from certain tasks solely because these were considered to be inappropriate to them "as boys" or "as girls" [44].

In Al-Jalazone, it was apparent from the very start of the club that children as well as adult participants had strong opinions about

what skills and tasks in the club activities were for boys and that other skills and tasks were more suitable for girls. In their field notes, the tutors report how boys and girls did their entire club work separately at first, strongly insisting that they would not work or play in mixed-gender teams. For some children, this was a matter of self-confidence: *"We have mostly boys and not so many girls. I wish more girls would attend the sessions. I'm ashamed, when I'm alone"*, one of the girls explains her insecurity. The children made their point of not working in mixed-gender teams with great emotion - e.g. in the case of one boy, who was seen to run away from the club room when he saw that he would have to team up with a girl, or in the case of two girls and a boy, who were seen to argue over the teamwork of constructing a tower, refusing to acknowledge each other's respective expertise and opinions. *"I want to work by myself so I can build the best tower in the class, and the girls don't know how to build it"*, the boy would say, and the girls simultaneously complained that the boy refused to collaborate and share and develop ideas with them. However, over the course of the project activity, they playfully experienced that by collaborating and sharing their expertise they were able to build a much stronger and skillfully crafted tower than each of them was able to construct on his or her own. After a while, the children had grown so fond of 'their' club that they often refused to leave the club and go home, when a session came to a formal end. *'The tutors told me to leave after the session. But I stayed, I want to learn something'*, a 14-year old boy said in an interview.

DISCUSSION

The comparative look at the two computer clubs revealed basic strengths of the concept. It showed how an openly structured learning setting was enabling especially girls and young women to make decisions about their education and career paths on a profound, independent and self-confident basis.

Two aspects were seen to be central. The first is concerned with access to education and employment. We saw computer club easily establish itself as a place where not knowing things was ok, and where free time was being used to learn and explore. This was the case in Dortmund, where the mothers engaged in discussing their current positions, career options, wrote job applications and also practiced their language skills. They discussed, valued each other's opinions and thus gained in confidence when pursuing their own educational or vocational paths. In Palestine also, the access to education was a central point: learning programming, acquiring ICT skills and developing an understanding of computer hard- and software and its functioning was seen to be a prerequisite for job opportunities in Palestine and beyond. In both places, access to education was also concerned with exploring ways to express oneself - creatively by programming individual stories, as was much valued by the children in Palestine, or in acquiring and developing language and writing skills, as was pursued with enthusiasm by the women in the club in Dortmund. This finding supports the results from Asthana & Havandjian [4] as well as Sawhney [35] on the impact of personal and social narratives for identity and personal development.

The second aspect is concerned with access to ICT: here, computer club was seen to be a place that can not only provide the access to computer hard- and software, but also present this ICT access in a way that is bound to overcome common assumptions about who can develop the skills needed to make use of ICT [c.f. 23]. Contrary to their regular experiences in their everyday school life, cultural values and beliefs, which usually interpose between female learners and resources [43], did not affect their learning

experience in the safe environment of come_IN computer clubs. This was the case in Palestine, where girls and boys playfully experienced that they can be much stronger when teaming up and sharing skills and expertise, and it was seen in Dortmund, where mothers 'built' their own computer in a "computer puzzle" project - a task that none of them had thought they would be able to complete. Here, findings that Rommes et al. [33] as well as Margolis and Fisher [20] have made in formal educational settings also showed for the informal setting of a computer club.

CONCLUSION

"The troubling gap between those who use computers and the internet and those who do not", is how Mehra et al. [21] have described the so called "digital divide". With our computer club approach we have shown, how an openly structured socio-technical local initiative is apt to contribute to the bridging of this gap and specifically address girls and young women, who especially in the Palestinian setting frequently have little or no access to ICT and ICT knowledge and therefore benefited the most from being involved in the project.

The computer club approach with its safe environment for children, adults and volunteers helped to overcome the separation that usually affects camp inhabitants in Palestine. It contributed to the establishment of contacts and friendships across camp borders, and it helped disrupting the prevailing gender separation, which participants gave up in the secure and collaborative environment of the computer club. In the intercultural neighborhood in Dortmund, barriers hindering equal participation in ICT and internet use were less apparent but nonetheless existent: the computer club quickly established itself as a place where knowledge could be acquired in a comfortable and friendly environment, and where not knowing was no failure but the starting point for individual as well as collaborative learning activity.

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