
Volume 23
Issue 6 *7th World Conference on Women's
Studies Special Issue: Transnational
Feminisms--Contexts, Collaborations,
Contestations: Toward a Liveable Planet*

Article 2

May 2022

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Recommended Citation

Hayman, Lorraine J. (2022). "You Cannot Be What You Cannot See": The Lived Experiences of Women Teaching Digital Literacy in Bosnia & Herzegovina and Germany. *Journal of International Women's Studies*, 23(6), 5-20.

Available at: <https://vc.bridgew.edu/jiws/vol23/iss6/2>

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“You Cannot Be What You Cannot See”¹: The Lived Experiences of Women Teaching Digital Literacy in Bosnia & Herzegovina and Germany

By Lorraine J. Hayman

Abstract

This timely paper provides empirical evidence on the lived experiences of ten women from eight nationalities in Bosnia & Herzegovina and Germany, who voluntarily taught girls and women digital skills in 2020. I situated this multi-case feminist study within the digital skills gender divide phenomenon. I collected qualitative data through surveys and interviews with the teachers, remote observations of their digital skills lessons, and analysis of programme documents, including curricula. In this paper, I discuss two research questions: (1) “What motivated the women to teach digital literacy?” and (2) “Why do the teachers think the digital skills gender divide exists?” The hybrid approach to data coding and thematic analysis indicated that the teachers were motivated to teach digital literacy to support their students’ self-development and use digital skills in their daily lives. The teachers at the school in Germany were also motivated by advancing their social capital and societal integration, as six of the eight women teaching in Germany were migrants. The teachers from Bosnia & Herzegovina were motivated by overcoming the systemic gender inequality that the digital skills gender divide encapsulates. The teachers also identified various personal, community, and societal causes of the digital skills gender divide. On the micro-level, they noted that girls engage in risk avoidance behaviour from a young age, limiting their digital skills development. On the meso-level, women lack exposure to Information and Communication Technology (ICT) within their families and communities. On the macro-level, the teachers in Bosnia & Herzegovina highlighted that girls living in urban areas could access ICT more often than those living in rural areas. This paper offers resolutions to the digital skills gender divide, concluded from the teachers’ evidence, such as educational opportunities, gender diversity hiring in technical roles in the ICT sector, and policy development to underpin solutions and incentivise compliance. This paper is my contribution to centralising in the scholarship the lived experiences and perspectives of diverse women who are at the forefront of the digital skills gender divide.

Keywords: Digital Skills Gender Divide, Remote feminist research, Multi-case study, Qualitative study, Women’s lived experiences

Introduction

In this paper, I share the voices of ten women from eight nationalities and different socio-cultural backgrounds. These women taught digital skills at schools in Bosnia & Herzegovina and Germany². By sharing the lived experiences of these women, I draw attention to the importance of including in the scholarship the viewpoints of diverse women impacted by digital gender inequality. Throughout 2020, the importance of research examining digital (in)equalities was confirmed after the COVID-19 pandemic reaffirmed how debilitating it is to lack digital skills. Kalia (2020) explained that video-calling applications have become vital for safe daily communication and that “it’s hard to imagine living without them” (para. 2). I undertook this research as a teacher, master’s student, Rotary Peace Fellow³, and digitally literate migrant woman from the United Kingdom living in Japan. These social identities

¹ Quotation from a teacher in the study.

² In this paper, the schools are not named as the study was anonymised to support General Data Protection Regulation (GDPR) compliance.

³ Rotary Peace Fellows are “peace and development professionals or practitioners” engaged in “academic training, practice, and global networking opportunities” provided by The Rotary

impacted my choice to explore the *digital skills gender divide* with women who teach digital skills. My background and experience undertaking this research during the COVID-19 pandemic underpinned the study and directed me to disseminate the findings. I continue to provide my conclusions to the schools in Bosnia & Herzegovina and Germany to support them in teaching girls and women digital skills. I also offered my research to conferences and publications that promote research centralising the lived experiences and perceptions of women from diverse backgrounds.

I conducted a multi-case feminist study to explore the digital skills gender divide. The digital skills gender divide is situated within the *digital divide* and *digital gender divide* scholarship. The digital divide “commonly refers to the gap between those who do and those who do not have access to [ICT]” and the digital skills to use it (van Dijk, 2006, p. 222). The Organisation for Economic Co-operation and Development (OECD) (2018a) explained that the digital gender divide resulted from disadvantages women face worldwide in the “differences in resources and in the ability to access and effectively utilise ICT within and between countries, regions, sectors and socio-economic groups” (p. 7). In the study, I used the ‘digital skills gender divide’ to highlight the digital skills competency imbalance between women and men in different contexts (see West et al., 2019). The schools influenced this choice as they identified they teach girls and women digital skills to enhance their digital literacy. Also, I intended that this study explore women’s capacity to “effectively utilise ICT”. After all, the digital skills gender divide affirms that the “socially constructed roles, behaviours, expressions and identities” of girls and women result in a disparity in their digital skills competency comparable to boys and men (Canadian Institute of Health Research (CIHR), para. 2).

This paper centralises the lived experiences of ten women who taught digital skills to girls and women in 2020. I surveyed and interviewed two teachers at the school in Bosnia & Herzegovina, surveyed eight and interviewed seven at the school in Germany, and observed eight online digital skills lessons at the same school. There are three cases in the study. Case One was a basic digital skills programme for women at the school in Germany. Also, at this school, Case Two was a computer coding programme for women. Case Three was a computer coding programme for girls at the school in Bosnia & Herzegovina. The study reinforces that listening to the women at the forefront of the digital skills gender divide is essential in developing a well-rounded picture of it. Consequently, in this paper, I suggest resolutions to the digital skills gender divide offered by the women in the study. These include educational opportunities, gender diversity hiring in technical roles in the ICT sector, and policy development to underpin solutions and incentivise compliance. In the following sections, I provide the background to the research, research significance, research design, thematic results, discussion, and conclusions.

Background to the Research

Digital Skills and Literacy

I initially applied no one definition of digital skills in the study due to the range of meanings in the scholarship (see van Dijk, 2013; West et al., 2019). However, after I observed the eight digital skills lessons at the school in Germany, I likened basic digital skills to using a computer keyboard and mouse and setting up an email account. Generic skills include browsing online safely and using Google Suite. Advanced skills encompass computer coding, such as reading/writing Python programming language. The United Nations Educational, Scientific, and Cultural Organisation (UNESCO) explained that digital literacy is “the ability to access, manage, understand, integrate, communicate, evaluate and create information safely and appropriately through digital devices and networked technologies for participation in economic

Foundation (Rotary International, n.d, para. 1). Rotary Peace Fellows undertake “fellowships for master’s degrees or certificate studies at premier universities” worldwide (Rotary International, para. 4).

and social life” (as cited in West et al., 2019, p. 13). This definition indicates the difference between using a digital skill to achieve an outcome, such as sending an email, and digital literacy, which extends to understanding and behaviour for socio-economic participation, like using ICT for social capital advancement.

The Digital Skills Gender Divide

The digital skills gender divide is a transnational phenomenon. Robinson et al. (2020) explained that “from information seeking to shopping, differentiated use and skills continue to manifest themselves...skill inequalities also exist from programming to software design to hardware engineering to [Artificial Intelligence] and beyond” (p. 3). Nevertheless, the digital skills gender divide presents differently around the world. In so-called “developing countries”, the proliferation of ICT and digital skills are “uneven with some cities and regions developing rapidly whilst others are disconnected” (Wessels, 2013, p. 18). However, attempting to explore the digital skills gender divide through a Nation-State lens is problematic as it won’t be experienced in the same way by everyone in each country. For example, a teacher in Bosnia & Herzegovina identified urban and rural divisions that impact students’ access to ICT: A girl living in rural Bosnia & Herzegovina will not experience the digital skills gender divide in the same way as a girl living in a city.

Moreover, Neuwirth (2017) explained that the “developed” and “developing” country phraseology, and the opposition implied, is “flawed both in philosophical and conceptual terms” (p. 911). Kessi expanded that the use of ‘developing countries’ “paints a picture of Western societies as [the] ideal” (as cited in Silver, 2015, para. 16). The implied hierarchy between ‘developed’ and ‘developing’ countries is mirrored in the digital divide terminology. Van Dijk (2018) identified that access to ICT, the “First Level of digital divide”, was the main concern in “developing countries” where the gap between those who have/do not have access is “still starting to grow” (p. 103/4). Contrastingly, Martínez-Cantos (2017) evaluated that within Western countries in Central Europe, the primary issue was the lack of widespread digital skills and ICT use for various activities, the “Second Level of digital divide” (van Dijk, 2018, p. 103). Van Dijk (2018) further distinguished the “Third Level” of digital divide: the “benefits of using digital media” (p. 103). What the “First Level”, “Second Level”, and “Third Level” of the digital divide identify is that while it is transnational, the digital divide presents differently worldwide, including access to ICT, the digital skills to use it, and the advantages of using it. Nevertheless, these terms also suggest a hierarchy. They imply that the “First Level” of the digital divide, which primarily affects low-income countries, falls behind the “Second Level” and “Third Level” of the digital divide, predominantly impacting middle-high income countries (see van Dijk, 2006). To avoid problematic terminology and recognise that the digital skills gender divide is different for everyone it affects, I opted to undertake a multi-case study, talking to women teaching in specific contexts at schools in Bosnia & Herzegovina and Germany.

Causes of the Digital Skills Gender Divide

The causes and consequences of the digital skills gender divide are contested, with scholars recognising different intersecting micro-, meso-, and macro-level roots. Barua and Barua (2012) identified that computers are viewed as “a man’s or boy’s thing” because institutions in patriarchal societies operate in an androcentric way (p. 467). Antonio and Tuffley (2014) considered that entrenched gender-norms in patriarchal societies contribute to the digital skills gender divide. They regarded that, in Southern India, due to gender-norms that women should support the family unit over self-development, women often “lack the basic digital literacy skills that could allow them to achieve more of their potential” (Antonio & Tuffley, 2014, p. 676). Galtung (1969) defined that “when the potential is higher than the

actual...violence is present” (p. 169). Applying Galtung’s (1969) definition of violence, if women are prevented from learning digital skills, which limits them in reaching their potential given the integral role of ICT worldwide, it is violence.

Furthermore, Wajcman (2010) stated that in Western societies, technology is “cast in terms of male activities” (p. 144). Such casting results in ICT, digital skills and literacy development, and careers in the ICT sector being rejected by women, asked to “exchange major aspects of their gender identity for a masculine version” (Wajcman, 2010, p. 146). Cooper and Weaver (2003) identified that girls in American schools become “disaffected and anxious” about using computers, reinforcing ideas that they are not as competent as boys (p. 15). Over time, girls find using computers and careers in the ICT sector unattractive, thus, perpetuating the digital skills gender divide.

Consequences of the Digital Skills Gender Divide

The impacts of the digital skills gender divide are numerous, including economic, social, and political. For example, Cooper and Weaver (2003) argued that the digital skills gender divide prevents women from “participating fully in the ‘new economy’ [which] precludes them from earning high salaries that sophisticated computer skills call forth in today’s world” (p. 6). Also, there is a lack of female role models in the ICT sector worldwide, especially in senior roles and at the frontiers of technological innovation (West et al., 2019). The wealthiest and most influential technologists are men, with only five women featured in the Forbes’ (2022) top 90 richest in technology list. In turn, this lack of gender diversity reinforces stereotypes about women and ICT, including that technical jobs are not viable for women, and ICT is a man’s domain (West et al., 2019). Consequently, Clayton et al. (2009) explained that gender stereotypes “provide misleading ideas about ICT as a career” and “make the field particularly unattractive to girls” (p. 153).

Additionally, women without digital skills and literacy cannot safeguard against technology-facilitated violence. Worrying, as West et al. (2019) identified that in countries where smart-technology devices are prevalent, Domestic Violence responders noticed an increase in cases involving “Internet-connected locks, thermostats, cameras and other [digital] devices” (p. 29). However, technology-facilitated violence is not limited to the domestic; it can transcend borders, making it a perplexing social problem to tackle (see Henry & Powell, 2018). The Barratt study (2018) demonstrated how misogyny and sexism online are normalised and that members of online forums “can enforce gender-based violence...through verbally aggressive speech acts that function as symbolic violence” (p. 16). As technological developments advance and ICT is embedded even further into our daily lives, technology-facilitated violence perpetrated against women with limited digital skills will undoubtedly worsen (Barratt, 2018). Barratt (2018) explained that “the online environment is a force that breaches offline boundaries...its effect must be accounted for as we attempt to build the resilience of feminist consciousness and gender justice” (p. 16).

Theoretical Foundation

I applied feminist and emancipatory lenses in the study. The emancipatory research paradigm emerged from the motto “nothing about us, without us” (Mertens, 2015, as cited in Noel, 2016, p. 3). This motto connects to transnational feminism, which often emphasises women in different countries collaborating for women’s rights and gender justice, supporting the “flow of ideas, issues, strategies, organisations, and activists across national boundaries” (Desai, 2007, p. 5065). Transnational feminism spotlights that feminism traditionally lacked collaboration with women from low-income countries and theoretically reflected “second wave, white, middle-class feminism” (Desai, 2007, p. 5065). In the study, I committed to engaging with “feminism that is inclusive, dialogic, decolonial, and capable of envisioning expansive

horizons of solidarity across gender, class, sexuality, nation, ability, race, and citizenship status” (Mohanty, 2017, p. x). I designed research sensitive to the participants’ intersecting social identities, including their national and socio-cultural backgrounds.

I also utilised sociological theories to support inductive and deductive data coding. Firstly, computer anxiety considers that the “feelings of discomfort, stress, or anxiety that people experience when responding to computers” are predominant in the digital skills gender divide (Cooper, 2006, p. 13). Secondly, the Social Cognitive Theory (SCT) highlights that individuals are influenced by what others achieve, causing them to form perceptions about their capabilities, or self-efficacy, to do the same activity (Bandura, 2001). Finally, the Social Shaping of Technology theory (SSTT) emphasises social processes that shape the form and features of ICT and the patterns, characteristics, and direction of the development and application of ICT in a society (Russell & Williams, 2002).

Research Design

The study included three cases that were digital skills programmes for girls and women. Case One was a basic digital skills programme for German national, refugee, and migrant women at the school in Germany. Case Two was a computer coding programme at the same school. At the school in Bosnia & Herzegovina, Case Three was a computer coding programme for girls. All Cases included girl/woman-only student cohorts, and the teachers were predominantly women.

Research Questions

I explore two research questions in this paper:

- (1) What motivated the women to teach digital literacy?
- (2) Why do the teachers think the digital skills gender divide exists?

Research Participants

This research included women from various backgrounds who had different nationalities and socio-cultural characteristics from myself: A white, English-speaking, British woman. While the teachers communicated with me in English, this paper includes the lived experiences of ten women from eight different nationalities (see Table One). In the study, I included every teacher who volunteered to participate. I wanted the research to be a collaboration between as many women as possible from diverse backgrounds, and I recognised that the teachers’ participation in this research extended their volunteerism and activism (Wilson, 2000). To comply with GDPR in Europe, the names I use in this paper are pseudonyms chosen by a name generator. During the consent stage, I informed the participants that I would allocate random pseudonyms and omit identifying information in the study. However, I provide the participants’ nationality in this paper to contextualise their perspectives:

Table One: Research Participants

Case	Teacher	Nationality/Current Location
One (1)	Sahar	America/Germany
	Sherri	Canada/Germany
	Frankie	Germany/Germany
	Esa	Germany/Germany
	Ashley	Iran/Germany
	Kiki	Mexico/Germany
Two (2)	Mira	India/Germany
	Tae	Spain/Germany
Three (3)	Gia	Bosnia & Herzegovina/Bosnia & Herzegovina
	Isa	Bosnia & Herzegovina/Germany

Cases Context

The school in Germany delivers digital literacy programmes and advocates for women's ICT access and digital skills development. They provide students with a computer for the duration of their studies. I had access to this school because the Case One and Two Programme Manager is also a Rotary Peace Fellow. The school in Bosnia & Herzegovina was founded with UN Women, the UN Development Programme (UNDP), and the UN Children's Fund (UNICEF). It is led by educators who champion women's rights worldwide. I had access to the school because the founder facilitated at UNLEASH Innovation Lab (n.d) for the Sustainable Development Goals in Shenzhen in 2019, in which I participated. We bonded over our like-minded approach to quality education and gender equality.

Methods for Data Collection

The COVID-19 pandemic compelled me to complete remote research, requiring significant collaboration between myself, the teachers participating in the study, and the schools I collected data at. To support this cooperation, I engaged in a two-way study, where the schools and teachers enabled my research, and I delivered teacher training on effective pedagogy for online lessons in return.

I collected qualitative data remotely between June and December 2020. I used triangulation in data collection and analysis, ensuring the research was accountable to the women in the cases. In Case One, I interviewed five teachers and surveyed six. In Case Two and Three, I surveyed and interviewed two teachers. I virtually observed eight online lessons, four in both Case One and Two. Finally, I analysed three programme documents in Case Three

and two in both Case One and Two. I chose these methods to promote the co-creation of knowledge between myself and the teachers in the study, decolonising the data collection process (Benavente & Cielemecka, 2016). After data analysis, I shared the results with the Programme Managers at both schools for their feedback. The Programme Manager at the school in Germany praised that the study “gave a voice” to the women at the school.

Data Analysis

I began data analysis in January 2021. I first coded the data deductively using codes developed from computer anxiety, the SCT, and SSTT theories. Secondly, to share women’s lived experiences, I applied an inductive method to coding, identifying patterns and themes within the data.

Research Significance

Despite recognition from international organisations like the UN that the digital skills gender divide is an issue, the lived experiences and perspectives of women at its forefront are rarely central in the literature. The scholarship lacks the viewpoints of diverse women affected by the digital skills gender divide. Hence, the existing picture of the digital skills gender divide is not well-rounded. In this paper, the ten featured women were from eight nationalities, offering the chance to hear from women with different socio-cultural backgrounds. This research highlights the importance of listening to diverse women about their experiences of teaching digital literacy and why they think the digital skills gender divide exists. It embodies “nothing about us, without us”. After all, the women in the study inspired the resolutions to the digital skills gender divide presented in this paper. No other studies feature these diverse women, making this research unique.

Thematic Results

Research Question One

Firstly, I address ‘What motivated the women to teach digital literacy?’ The analysis revealed that the teachers wanted to support the students in developing digital skills for daily life and employment. They also volunteered for self-development and networking opportunities.

Student Self-Development

The teachers were motivated by positively impacting their students’ lives by developing their awareness of different career options. (3) Isa⁴ stated that Bosnian culture perpetuated the traditional stereotype of having children and maintaining the nuclear conjugal family unit. She explained that the programme was designed to support girls to see beyond gender-norms and stereotypes, advocating careers in the ICT sector. (3) Isa expanded that she was “focused on empowering young women and girls to join tech and engineering”. (3) Gia concurred that she was “angry at inequalities” and wanted “to smash [the] patriarchy along with wishing to create more job opportunities for women in this sector”. She furthered, “for us in Bosnia & Herzegovina...it’s important to showcase actual women from here succeeding in their [ICT] career paths”. (3) Gia explained that in Bosnia & Herzegovina, “most high-level jobs require digital skills [and] women’s lack of access to technology makes them economically subordinate to men”. She said, “I want [the Case Three programme to] be a place which inspires girls to go out into this world and then take what they deserve”. My analysis of Case Three’s programme documents found that the schools’ goal was “enhancing the girls’ skills to empower them to

⁴ The number before the teachers’ pseudonym illustrates their membership of Case One (1), Case Two (2), or Case Three, (3).

pursue a career in ICT". These data suggest that the teachers in Case Three were aware that girls in Bosnia & Herzegovina are limited by gender-norms and stereotypes about women and ICT careers. Their programme aimed to provide girls with the chance to learn advanced digital skills and consider an alternative future working in the ICT sector in a technical role.

Providing students with digital skills to support them in their everyday lives, especially for refugees and migrants, motivated the Case One and Two teachers. (1) Esa said the opportunity to help women navigate daily life online motivated her as "digital technology is important everywhere nowadays but especially in Germany where there are many people with advanced digital skills". (1) Sherri reported that "even making appointments with the KVR office (the government agency that helps with finding work and residence permits in Germany) requires using their online platform". (1) Sahar shared that as a migrant in Germany, "much of my life was easier because I could Google it beforehand". These data imply that the teachers who had migrated to Germany were notably aware of the importance of digital skills to support them in navigating their daily lives.

Teacher Self-Development

The teachers in Case One and Two were motivated to volunteer to build their networks and for their self-development. (2) Mira explained: "I was new to the city [in Germany], [and] I thought I would like to start with doing some voluntary jobs so that I can also meet friends". She furthered that the school offered the chance to teach in English, which she could not do in German because of language limitations. Also, (1) Ashley stated that voluntarily teaching allowed her to improve her teaching skills because she wanted to become a professional teacher. Case One and Two teachers recognised that volunteering supported their integration in Germany, extending their social capital. (1) Sahar explained that teaching digital skills was "a good way to be more connected to people in your community that we probably wouldn't interact [with] otherwise". The data highlights that these teachers were motivated by the opportunity to meet new people, volunteer in English, and learn new skills.

Research Question Two

Secondly, I address, 'Why do the teachers think the digital skills gender divide exists?' The analysis revealed personal, community, and societal themes.

Personal Factors

The teachers suggested that a root of the digital skills gender divide was that girls engage in risk avoidance behaviour from a young age. In contrast, boys have curiosity and develop technical awareness. (3) Isa explained, "boys are more willing to take risks...girls...they want to be sure that it won't be their fault if something goes wrong". (3) Gia said, "it starts from a young age...fear becomes an obstacle". She identified that risk avoidance and the fear of failure resulted from "socialisation and not wanting to be the outlier". (1) expanded, "men are more drawn to digital devices, and therefore they find a way to interact with them". She suggested that men do not experience the same fear concerning ICT as women. The teachers believed that the fear of making mistakes results in girls and women having reduced self-efficacy and confidence when using ICT. In turn, they fail to learn digital skills at the same rate as boys and men.

Community Factors

The teachers implied that girls are often not exposed to computers in childhood by their families and communities, limiting their interest in ICT and digital skills development. (1)Sahar explained that digital skills become harder to acquire as adults if individuals do not have exposure to ICT in childhood. She stated, "I've noticed that a lot of the things that I assumed

were intuitive [are not]. I just have so much exposure". (1) Sherri reported, "I was never interested in computers, and that could be because of my parents...I never had the access". She considered that in not having access to a computer in her formative years, she lacked interest in using ICT as an adult. (1) Sherri expanded that her husband was a "tech guy" who, as a child, would "rebuild and play around with computers". He joined a beginner course in computer coding with a female colleague, "but because he had so much experience with computers, he had more facility learning the content than she did". (1) Frankie stated that her friend, who studied informatics, was asked by family members, "why don't you do something different?" They did not see a career in informatics as viable for her. The teachers believed that familial support and exposure to ICT in childhood affects the digital skills gender divide. Moreover, the teachers reported that there is not enough representation of diverse women in the ICT sector. (2) Tae explained: "If you don't see a woman driving a truck, you maybe don't think, oh, I like driving trucks. You then don't go for it". (3) Gia concurred that "you cannot be what you cannot see". The programmes in the study provided gender-segregated learning experiences. (2) Tae highlighted that the gender-segregated programmes showed investment in women. (3) Gia agreed that "we asked them [the students] would you like to include boys in your training, and they said no, boys just takeover...this is our space". She furthered that in gender-segregated teaching spaces, the students "are not experiencing the pressure of their [male] peers...they have some space to learn something new". The gender-segregated learning environments in the Cases provided a supportive environment in which girls and women could learn.

Societal Factors

The teachers in Case Three reported urban and rural divisions in Bosnia & Herzegovina that affect students' access to ICT. (3) Gia explained that "rural areas are poorer areas; some schools do have computers...but they keep it under a lock. The children are not allowed to use the equipment". She said that this makes it difficult for students from rural areas to learn digital skills at the same level as those living in urban areas. (3) Isa expanded that "in more rural areas, the girls didn't know some of the [basic] keyboard functions". In Bosnia & Herzegovina, the teachers outlined that issues with ICT access and digital skills development for girls living in rural areas contributes to the digital skills gender divide.

Furthermore, the teachers felt that women face gender stereotypes, which puts them off learning advanced digital skills or undertaking careers in ICT. (2) Mira talked about the "stereotypes [that] women are not good at computer programming or not good with technology". She explained that the typecast that competent technologists are men has caused people to question her computer coding capability. People asked her, "oh, so you can programme?" and there "were surprised reactions" when she said she could. (2) Tae argued that women think: "I don't want to be in...three years of studies with guys and [a career with] all-male colleagues". The teachers explained how gender stereotypes about women's technical abilities cause career options in ICT to be predefined. The teachers who acquired advanced digital skills faced people typecasting them as less competent than men. This reality discourages girls and women from pursuing digital skills and ICT careers.

Discussion

Overcoming the Digital Skills Gender Divide

While there are various steps to resolve the digital skills gender divide presented by international organisations (see West et al., 2019), three prevalent ideas are supported by the findings in the study. On the meso-level, prioritising education and the employment of diverse women in ICT, and on the macro-level, policy development to underpin solutions and incentivise compliance.

Education

Compulsory Education

The Cases in the study were examples of non-compulsory informal and tertiary education provision. However, the OECD (2018a) considered that “compulsory education helps to eliminate the digital [skills] gender divide. Compulsory schooling is crucial to ensure that individuals gain the basic skills and competencies needed for full participation in labour markets and society” (p. 9). Mitra (2016) agreed, stating, “Computer Science (CS) should be...mandatory in kindergarten and elementary schools” (p. 43). West et al. (2019) argued the importance of incorporating “ICT skills, [CS] and computational thinking *into the curriculum for all subjects and at all education levels* [emphasis added]” (p. 40). Rusk et al. (2007) concurred, noting “the importance of providing multiple entry points” into advanced digital skills within school settings (p. 59).

Informal and Tertiary Education

Nonetheless, given how prolific the digital skills gender divide already is, “more flexible opportunities [are needed] for adults to upgrade their skills” (OECD, 2018a, p. 9). Investing in teaching digital skills and literacy in compulsory education is important, but informal and tertiary education provision is also vital for women who want to learn digital skills. To encourage women to engage in tertiary ICT study, West et al. (2019) argued they need incentivisation. West et al. (2019) explained that “enrolment [in tertiary education] can be incentivised through scholarships for women who choose to specialise in ICT fields” (p. 37). While the Cases featured in the study did not offer scholarships, they incentivised girls and women to learn digital skills by providing lessons that did not incur tuition fees. The school in Germany also offered child-care support to enable mothers to attend lessons.

Exposure to ICT

The findings imply that some teachers recognised the digital skills gender divide emerges in childhood. These data are consistent with the Mitra study (2016): “The essential difference between the genders in the interest and knowledge in [CS] stems from exposure (or the lack thereof) at a young age” (p. 43). West et al. (2019) considered that “increasing girls’ and women’s digital skills involves early, varied, and sustained exposure to digital technologies” (p. 37). The teachers in Case Three emphasised the importance of early intervention and exposure to ICT in their programme by directing their computer coding lessons at girls. Also, in 2021, the school in Germany launched a computer coding programme for children.

Gender-Appropriate Education

Women developed the programmes featured in the study for girls and women. The University of California, Los Angeles (UCLA) (n.d) suggested that women are more likely to teach in gender-appropriate ways. Betterplace (2019) identified that “safe digital spaces for women...and [using] peer-to-peer approaches in education programmes” are important when supporting women to learn digital skills (p. 9). West et al. (2019) argued that “while the global trend is moving away from [gender]-segregated education, it may be helpful...when teaching digital skills, as a way to boost girls’ engagement and self-confidence and to create a safe space” (p. 48). Supporters of gender-segregated education argued that it “improves learning and performance by allowing a better match for teaching and learning” (UCLA, p. 2). Critics argued that gender-segregated education lacks favourable empirical evidence and “few educators are formally trained to use gender-specific teaching techniques” (Stanberry, 2012, para. 13). Teacher training that accounts for gender-specific teaching methods could be an important step in ensuring digital skills and literacy education moves away from existing teaching methods

that favour the learning preferences of boys and men (Mitra, 2016; Rusk et al., 2007). Further research into gender-specific teaching methods for digital skills lessons and gender-segregated classrooms would be beneficial.

Gender Diversity Hiring in Technological Innovation

Diversity

The teachers across the Cases identified a lack of diversity in the ICT sector, a finding consistent with the digital skills gender divide literature. Brewer (2017) argued that the lack of women in the ICT sector is rooted in how historically women were “systematically phased out [of ICT jobs] and replaced by men who were paid more” (para. 5). Bogdan-Martin (2018) noted that for the women who do work in ICT, “many...complain of a toxic, testosterone-centric culture that undervalues women’s contribution and limits their ability to get ahead...the result is a dearth of female role models to inspire younger generations” (p. 19). Chapple identified that, as a black woman in STEM (science, technology, engineering, and mathematics), she “couldn’t see women of colour, especially black women, rising to higher ranks in academia [in America]-especially in STEM fields” (as cited in Mohan, 2022, para. 15). Chapple equated this to the “intersectional leaky pipeline...a metaphor for the progressive loss of competent women from senior positions in the fields of STEM” (Mohan, 2022, para. 16). Mohan (2022) expanded that “women, and particularly women of colour, [face] many barriers and obstacles to advancing further in their [STEM] fields” (para. 17). Firstly, more women need advanced digital skills. Secondly, when the ICT sector has women working in technical roles, it needs to ensure they do not fall victim to the “leaky pipeline”. Digital skills programmes like those in the study can help quell the digital skills gender divide, equipping diverse women with the advanced digital skills and experience needed for employment in technical roles and advocating for greater gender diversity in STEM.

Critical Mass

Nevertheless, to overcome the “leaky pipeline”, hiring more diverse women into senior positions in the ICT sector, paying them an equitable salary, offering them promotions, and providing support like childcare provision, should be prioritised. The Kramer et al. (2006) study into boardroom reform in Fortune 500 companies found that a “critical mass” of women can “cause a fundamental change in the boardroom”, enhancing “the likelihood that women’s voices and ideas are heard” (p. 2/3). Women at the boardroom level within ICT companies can advocate on behalf of female technologists and the women using their technology by including “the perspectives of the multiple stakeholders who affect and are affected by company performance” (Kramer et al., 2006, p. 3).

Quotas

West et al. (2019) argued that “quotas and hiring targets have also been suggested as effective strategies for technology companies to ensure more gender-balanced staff, management and boards” (p. 38). Though “controversial”, quotas can enhance diversity and representation in the ICT sector (West et al., 2019, p. 38). As Black highlighted, when greater representation is achieved, “we won’t need the quotas anymore...everyone will have realised it’s better if you have more diversity” (as cited in Preece, 2016, para. 15). The UN Population Fund (UNFPA) (2005) explained that “to ensure fairness, strategies and measures must often be available to compensate for women’s historical and social disadvantages that prevent women and men from otherwise operating on a level playing field” (para. 2). Hence, quotas to improve the representation of diverse women in the ICT sector within senior and technical positions can support systemic change.

Policy Development

The solutions suggested in this paper can be enhanced through policy. The OECD (2018a) argued that “the design and implementation of national digital strategies that actively aim to close the gender digital access, adoption, and usage gaps, and improve the affordability of digital technologies while enhancing online safety” are essential (p. 17). Although West et al. (2019) noted that “private-sector hiring practices may be considered outside the scope of State intervention”, they identified that “governments can still lead the way by committing to increase the number of women working in ICT-related positions” (p. 38). If gender-appropriate education and quotas for gender diversity hiring in senior and technical roles in ICT companies were enshrined in policy, this would incentivise education and ICT organisations to comply.

Research Limitations

I interviewed the teachers in the study once, providing a glimpse of their lived experiences at that time. Future studies could allow for data gathering over time. Also, I intended the empowerment of the women participating in the research. However, it is undetermined whether I achieved this from the perspective of the women featured. Future research intending the empowerment of research participants should consider a follow-up/feedback survey. Finally, I sought to limit the impact of my bias on the findings through triangulation in data collection and by sharing my conclusions with the Programme Managers at the schools in Bosnia & Herzegovina and Germany in advance of publication.

Concluding Remarks

In this paper, I highlighted that without the voices of women at the forefront of the digital skills gender divide, including the ten teachers featured, the scholarship lacks a comprehensive picture of digital gender inequality. The existing picture often fails to spotlight the lived experiences of diverse women worldwide who collaborate to challenge and overcome the digital skills gender divide. Moving forward, it is paramount that scholars embody “nothing about us, without us” when researching the digital skills gender divide, centralising the lived experiences and perspectives of women at the forefront of it.

The digital skills gender divide has varying micro-, meso-, and macro-level causes and consequences and is a complex transnational phenomenon. There exist social, economic, and political consequences of the digital skills gender divide, including technology-facilitated violence perpetrated against women. Overcoming it is a considerable challenge in achieving a liveable planet for all women. In this paper, I propose solutions to the digital skills gender divide concluded from the ideas of the women featured. These resolutions included educational opportunities, gender diversity hiring in the ICT sector, and equitable policy development. While quotas in education and employment are unpopular, they would enable women to obtain advanced digital skills, get hired into senior and technical roles in ICT companies, and avoid falling victim to the “leaky pipeline”. Without greater gender diversity in the ICT sector, the digital skills gender divide will undoubtedly continue. Nevertheless, I recognise that the gaps between women’s and men’s digital skills competency are symptomatic of patriarchal societies. Resolving the digital skills gender divide also requires dismantling the systems and structures that prevent women from reaching their potential. In (3)Gia’s words, we must “smash the patriarchy”.

Acknowledgements

Thank you to Rotary International, The Rotary Foundation, the Masafumi and Hatsumi Fukui Endowed Rotary World Peace Fellowship, Dr Insung Jung, Dr Joo-Young Jung, Dr Mikiko Nishimura. *A heartfelt thank you to the women that made this research possible.*

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