Gender and ICT: school and gender stereotypes

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***Abstract* - Information and communication technologies (ICT) are intertwined with almost every aspect of our daily lives, they have become central to the way we communicate, work and socialize. ICT are increasingly a structural aspect of societies, however, ICT continue to be a highly gendered area of life in all socioeconomic and educational backgrounds, and a source of significant social inequality in enduring ways. This paper reports on an ongoing research project 'Gender@ICT' which explores the interrelations of gender and technologies in an educational context in Portugal, based on focus groups and group activities (games with images related to ICT and gender) with preschool children and 9th grade students. The results bring evidence that ICT is highly related to gender stereotypes which affect boys and girls representations and practices, including their educational and career choices.**

Keywords – Gender; ICT; Kindergarten; School

I. INTRODUCTION

This paper reports on an ongoing research project 'Gender@ICT' which explores the interrelations of gender and Information and Communication Technologies (ICT) in preschool and 9th grade. Gender differences in ICT use are explored in their social complexity. One must consider that gender is not universal, it is the culturally local behavioral expressions of an internalized individual identity that includes understandings of masculine and feminine, tailored to the specific culture in which a child develops. Gender identity is a pattern in time, it is shaped by the preceding dynamics of physical, social, and emotional experience and becomes the basis of future identity transformations [1].

Research on gender and ICT in Portugal is very limited and mainly focused on subjects related to education and occupation/jobs [2]. The relevance of education and occupation/jobs is in line with international research and reflect the main areas of the gender gap in society [3]. Notwithstanding some relevant initiatives in Portugal that produced significant and groundbreaking literature on gender and ICT/technologies, the academic production, namely Master and PhD thesis do not significantly address this topic. Conferences on ICT do not promote gender related issues, thus contributing to the "deserted landscape" of Portuguese research on gender and ICT [2]. The research project 'Gender@ICT' aims to fill this research gap.

'Gender@ICT' research project adopts a critical discourse perspective in which gender differences in ICT use are understood as a result of gender-technology and power-knowledge relations, aiming to disclose the tension between agency and structure that is worked out by individuals in particular contexts. This project aims to explore the embodied relationship between gender and ICT, informed by Feminist Technology Studies (FTS), based on the understanding that both gender and technologies are social constructions. Objects and artifacts are not seen as separate from society, but as part of the social fabric that holds society together; technology is understood as a sociotechnical product – a fluid network combining artifacts, people, organizations, cultural meanings and knowledge [4] [5]. The main goal is to investigate how do technologies affect and are affected by gendered practices, e.g., how individuals construct their relations to technologies, with a special focus on how gender makes a difference within this construction. The 'Gender@ICT' is a project with a qualitative methodological approach, based on face-to-face individual semistructured interviews and group interviews with preschool children and 9th grade teenagers, developed in a school context. The researcher works as an educational psychologist in the school cluster Sebastião da Gama, in Setúbal, Portugal, where the research takes place. As such the researcher is not an outsider who proposes activities to the students, the research data will be collected within a familiar context for the students. The interviews are focused on how gender relations are materialized in technology, and on how gendered identities, discourses, and technologies are simultaneously produced.

II. GENDER AND ICT

Often research on the gender gap in ICT turn women into the "problem", isolating their ICT usage from broader social factors which shape their social opportunities and social identities. Focusing on women ICT preferences and skills research can contribute to reinforce power inequalities, overlooking the more complex and substantive reasons why women do not choose to enter technological professional sectors. Gender equality in ICT is not only about equal numbers of men and women, boys and girls, using technology, but it is also about using it purposefully, meaningfully and productively, in ways which enhance individual well-being as well as democracy [6]. When analyzing gender equality in ICT one must consider that gender is not an isolated category of difference. It is important to acknowledge the various ways that gender, race and class and other categories of difference interconnect to create a particular social location from which each woman experiences everyday life, including interactions with technology [7]. Intersectional approaches are required to fully understand the inequalities in the use of technologies.

Since education is a key area in promoting change in society, schools are powerful instruments of gender policy and workforce equity and it is of the outmost importance that they

do not reproduce social inequities. Further measures and instruments of gender policy and workforce equity in society are required more widely. The emphasis should not be mainly on how schools and their ICT usage can contribute to bridging the ICT gender gap, but rather on trying to avoid ways of reproducing inequities in schools. Moreover, it is also known that technology might be a driver to obtain more gender equity in society and, accordingly, ICT is "both a tool and a goal" [6].

ICT design strategies should acknowledge the diversity of "real" people, using the gender concept as a continuum rather than a set of binary oppositions [8], avoiding the risk of exacerbating gender inequality by stereotyping women [9]. Instead of ghettoizing girls as a population that needs "special help" in their relation to technology, we should encourage boys and girls to express aspects of self-identity that transcend stereotyped gender categories, broadening the range of available options in order to open up new space for a diverse range of experiences and identities for both girls and boys [8]. According to OECD [6] the emphasis for gender equality in ICT should be on trying to avoid ways of reproducing inequities in schools rather than using schools (and their ICT usage) as instruments of gender policy and workforce equity in society more widely.

III. Methodology

The 'Gender@ICT' research project has three phases (Fig. 1) which include focus groups, class activities (games with words and pictures related to ICT and gender) and semistructured interviews. The focus groups with 9th grade students inform the structure and content of the class activities, and the semistructured interviews with ICT teachers contribute to further explore the gendered representations associated with ICT and to identify educational practices that promote gender equity. The class activities with preschool children and 9th grade students engage mixed-sex groups in games with words and pictures to explore how gendered identities and discourses are produced simultaneously with technologies. Researching with preschool children (around 4/6 years old) and 9th grade students (around 14/15 years old) gives us the opportunity to analyze gender stereotypes in different stages of development.

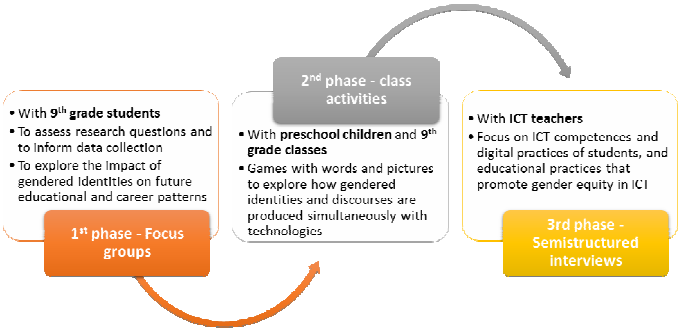

Fig. 1. Research phases

This paper reports on the preliminary results of the focus groups and class activities with preschool children and 9th grade students in a school context. The school cluster Sebastião da Gama, where the research takes place, has seven schools: two preschool and 1st cycle, three 1st cycle, one 2nd and 3rd cycle, and one 3rd cycle and secondary, with a total of 135 classes and about 3.000 students. Students' age ranges from 4 years old to 18/20 years old. The educational system in Portugal is divided into preschool (for those under age 6), basic education (9 years, in three cycles) and secondary education (3 years).

By technologies this project refers to computers and convergent multifunctional portable devices connected to the Internet via wifi or 3G/4G, such as smartphones and tablets. These devices are the most used by young people in their everyday activities [10].

A. *Activisties with preschool children*

Researching with preschool children requires that: focus groups should be similar to "natural groups" (i.e., pre-existing social groups, such as friends, classmates, etc.), conducted in informal peer group settings such as classroom situations, and the location of the research should be familiar to the child [11]. The group activities with 32 preschool children, aged from 4 to 6 years old (14 girls and 18 boys), were conducted during November and December 2016 in children's kindergarten and explored their representations on gendered activities and behaviors. During class activities children were organized in mixed-sex groups with 4/5 children while engaging in games with images (Fig. 2 and Table 1). The games aimed to explore how gender relations are materialized in technology and how gendered identities, discourses, and technologies are produced simultaneously.

Children were asked to describe 4 pictures: the woman with the laptop, the man with the laptop, the woman with children, and the man with children (Fig. 2). The laptop with the screwdriver was meant to direct the conversation to broken laptops, so that the conversation was not only about using computers but also about how to fix them.

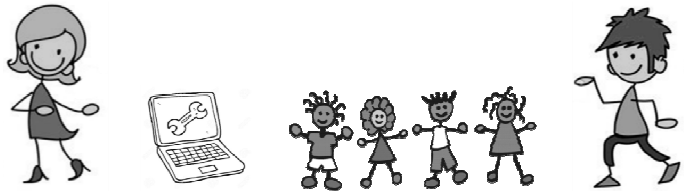

Fig. 2. Examples of images used in the activities

From a set of images (Table I) children had to decide which toys would girls and boys more probably receive at Christmas. They had to argue and discuss until they decided. The images were all randomly spread over the table. Their discussions were audio-recorded, transcribed and analysed.

TABLE I. List of the images of toys

ICT related	"Boys' toys"	"Girls' toys"	More gender neutral
Laptop; Tablet; Smartphone	Car; Weapon; Tools; Car track; Soccer ball; PlayStation	Microwave; Hair Dryer; Baby stroller; Ironing board; Pots and pans; Doll	Teddy; Bicycle; Puzzle; Lego; Xylophone

B. *Activisties with 9th grade students*

The students of 9th grade in Portugal are mostly 14/15 years old, and at a time of their lives when decisions regarding education and career have to be done. After ending the 3rd cycle students have to choose a secondary course from general and professional programs. Gender roles are a decisive aspect of these decisions [12] and of these ages (14 to 15 years old) young people are particularly aware of the gendered aspects of their lives [13]. There were four focus groups with a total of 18 9th grade students organized around questions related to the ICT uses of young people and possible gender differences. The class activities engaged 12 mixed-sex groups (~4/5 students per group, a total of 49 students, aged from 14 to 16 years old, 26 girls and 23 boys) in games with words to explore how gendered identities and discourses are produced simultaneously with technologies. During the class activities students were asked to arrange the following phrases (Table II) in two separate groups, and to explain their options.

TABLE II. PHRASES USED IN CLASS ACTIVITIES

Always in Facebook	Always with a mobile phone	Can fix computers
Can´t live without the Internet	Cares about the looks	Has good grades
Is good with technologies	Likes a lot to use a computer	Likes online war games
Likes to fix thing at home	Likes to practice sports	Likes to read
Spends lots of time fixing the hair	Spends lots of time in computer games	Uses skirts
Wants to be a kindergarten teacher	Wants to be a football player	Wants to study engineering

IV. RESULTS

A. *Results of the activities with preschool children*

It was possible to observe some specificities of researching with preschool children in kindergarten. For example, occasionally a child stands up and says “I have to poo”, and before children engage with the tasks they thoroughly touch and explore all the images.

In the images showing children and adults, the participants almost always identified the woman as a teacher and the man as a relative (father, brother) or physical education teacher. These ideas are clearly related to their experience, there are almost no kindergarten teachers in Portugal (only 0,9% of Portuguese kindergarten teachers are male) and it is common that the men who work in the Portuguese kindergartens relate to physical education. When asked about what the woman and the man would do if the laptop was broken, only 4 (3 boys and 1 girl) out of 32 children mentioned the possibility of the woman repairing it, although many also said that the man would go to a repair shop. In the discussion, it was clear that for all the children only men work in computer repair shops. Dialogue about repairing computers:

If the computer is not working she cannot do anything, she will go to a repair shop. Participant 3, Boy, 4 years old

She cannot fix the computer because she is a woman; she is not a man. Participant 6, Boy, 4 years old

She can ask a man to fix the computer. Participant 1, Girl, 5 years old

The ones who fixes the computers are the men. Participant 10, Boy, 5 years old

There are only men working in computers repair shops. Participant 9, Girl, 4 years old

The 4 children who interpreted an image as a woman repairing a computer, have direct experience with women who use it every day.

The social cultural context strongly socializes children, according to gender stereotypes; in particular toys’ marketing is highly gendered [14]. As such, in the game with toys’ images, unsurprisingly toys were mostly attributed according to gender stereotypes. Children showed difficulties in deciding about the more gender neutral toys, and the decisions varied from group to group. In line with the literature regarding ICT related toys [14], all the boys and most of the girls attributed the laptop to boys, and the tablet and the smartphone were more equally attributed to both (Fig. 3). The use of mobile devices by girls, such as smartphones and tablets, is on clear rise according to recent research [10].

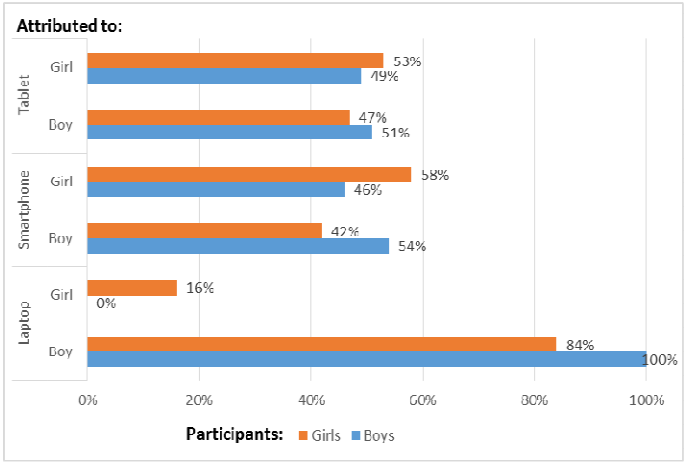

Fig. 3. Results of the game with ICT related toys’ images

The reasons children present to decide on which toys they attribute to either a girl or a boy are closely related with their experiences at home.

One of the girls said that the ironing board could also be for a boy because her father also uses it. The other children reacted immediately saying that this was not true because their fathers did not use the ironing board. It is almost always about their own personal experience. Dialogue about pots and pan:

Pots and pans are for the girl, boys don’t cook. Participant 12, Boy, 4 years old

No, it can be for both, they both can cook, my mother cooks and so does my dad. Participant 14, Girl, 5 years old

No, no, only for girls, my mother cooks but my father never cooks. Participant 2, Girl, 4 years old

The importance of social representations and changes in the gender social roles also have an impact. As an example, when they talk about weapons:

The weapon can also be for the girls. Participant 7, Girl, 5 years old

Yes, it can be because women can be cops, they can go to the army. Participant 17, Boy, 5 years old

Although they had this conversation they ended up deciding to attribute the weapon to the boy.

Most preschool children evidenced stereotyped representations on ICT and gender, reproducing the ICT gender gap. Only the few children that reported diverse gender representations at home disclosed more gender inclusive perceptions of ICT, evidencing the importance of diversity on gender representations.

B. Results of the activities with 9th grade students

In the class activities the phrase "Uses skirts" worked as a gender marker, although the instructions did not mention that each set of phrases had to be gendered, all the groups identified one set of phrases with a girl (the one with the phrase "Uses skirts") and the other set of phrases with a boy. It is noteworthy that no group chose not to identify either with a girl or boy, neither considered the possibility of both sets of phrases being the same gender.

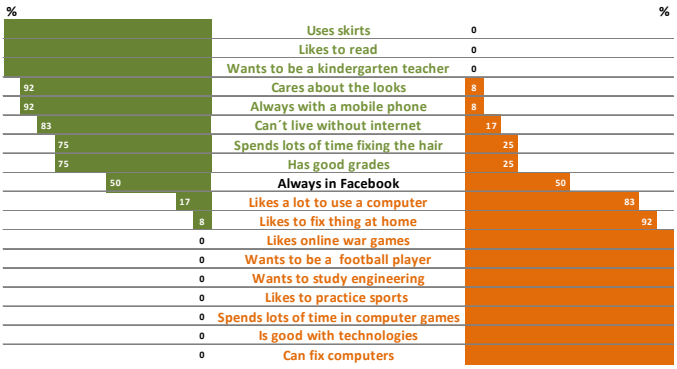

Fig. 4. Results of word games in 9th grade class activities

From the 18 phrases (Fig. 4) almost 40 percent were exclusively attributed to boys and only 16 percent were exclusively attributed to girls. According to the objective of this research there were several phrases (8 phrases) directly associated with technologies. From the 8 phrases associated with technologies, 4 were exclusively attributed to boys (Can fix computers, Likes online war games, Is good with technologies, Spends lots of time in computer games), 1 was mostly attributed to boys (Likes a lot to use the computer), 1 was evenly distributed (Always in Facebook) and only 2 were mostly attributed to girls (Always with a mobile phone, Can't live without the Internet). Identifying girls with using a mobile phone and depending on the Internet is consistent with research results, such as 'Growing Up With Screens' [10] which reported on the clear rise of girls' use of new mobile media, such as smartphones to go online. The way participant students characterized girls' ICT usage was restricted to using mobile phones and Facebook, and depending on the Internet. On the other hand boys' ICT usage is clearly associated with computer and online games, and the competence to fix computers, including the evaluative idea that they are good with technologies.

The professions included in the phrases: engineer, football player and kindergarten teacher, were unsurprisingly attributed according to gender stereotypes and the existent social context. The lack of women in engineering is one of the gender ICT gap evidences, the reduced number of female football players is also a reality in Portugal, and only 0,9 percent of kindergarten is men according to the statistics of the Ministry of Education.

It is noteworthy that students associated the use of Facebook equally to both girls and boys. This was the phrase that they had more difficulty to decide on. Social networking seems to be a more gender neutral ICT usage.

Some groups identified boys as the ones who spend time fixing the hair which may be a consequence of the actual social tendency of boys/men caring about their looks. As an example of this social tendency, for some time now it is more common to see publicity to beauty products for men.

The main conclusion of this activity is that the way students choose to organize the phrases reveal the existence of stereotyped ideas on gender roles, including in the use of ICT and technologies. It seems that the fact of girls using more technologies than previous generations, such as the mobile phones and the Internet, has no effect on the stereotypes around gender and technologies. The focus group data can contribute to better understand these results.

Some of the participants in focus groups say that technologies are present in their lives since they were born. This reality is completely different from their parents and teachers given that technologies were not as widespread when they were young as they are today.

I have been around technologies since I was born, I was born playing tablet … (laughs) Participant 1, Boy, 13 years old

When I was 5 years old I played PlayStation with my father. Participant 2, Boy, 14 years old

Adults are seen as less competent in technologies than young people. By interacting with adults, either teachers or parents, young people acknowledge that some adults lack digital competencies and sometimes need the help of students and children.

My father is a nerd in technologies, he knows a lot more than me, but I have to help my mother to use the computer, she needs help. Participant 2, Boy, 14 years old

I was the one who taught my father to use the computer, my mother has been never interested and she goes always in the kitchen. Participant 5, Boy, 14 years old

In the previous statements there are some references to gender differences, and these differences become even more present as the conversation progresses. Starting with the adults who first introduced children to technologies, there is a clear difference on how participants understand the way men and

women relate to technologies. The adults that first introduced them to technologies were mainly men, either the father or someone related to the family. Also, fathers or men close to the family spend more time playing computer games with them.

I learned with my friend's father, he taught me how to play games on the computer. I used to play with him. Participant 7, Boy, 14 years old

I learned how to use a computer with my father, and later at school. My mother is not very good at it. Participant 8, Girl, 14 years old

The idea that there are gender differences in what concerns the use of technologies was common to all the participants in focus groups. Although according to them gender differences are more evident in older people than for young people, there is still a difference between boys and girls. Boys are more interested in technologies, in particular on the "hard" side of technologies, like fixing devices.

Men are more interested in technological stuff than women, although I think that in our age things are more equal, and we all use social networks and the Internet. Participant 9, Boy, 14 years old

Boys are more into informatics, they like it more, they like to fix computers and stuff like that, we also like computers but they like it more, they are more engaged. Participant 10, Girl, 14 years old

Besides the idea that women are less competent using technology than men, some participants stressed out that it is more frequent to have male students volunteering to help teachers to solve technological problems than girls, which further highlights gender differences.

When teachers need help using the computers in the classroom, boys are always the first to volunteer to help. And if they go the girls don't need to go. Participant 10, Girl, 14 years old

Challenged to explain gender differences in using technologies, participants identified diverse reasons and constraints, such as: family expectations, peer pressure and social context. Being raised as a girl or as a boy has a distinct influence on how a child sees her/himself and what social role is expected from her/him. Even though gender social roles are changing, participants in focus groups pointed out that nowadays girls still feel pressed to be responsible for the house care which affects their educational and professional choices. To take care of children and the house are expectations that girls have to deal with when planning their future. As for boys the emphasis is more on professional achievement.

Women are responsible for the house care, like cooking, cleaning, ironing, and our mothers tend to teach their daughters to do the same. They influence us to be housewives and expect that we do like they do. I think that boys also expect us to do the same as their mothers… I don't know if it has to be like that, but everyone expects it. Participant 11, Girl, 14 years old

Peer pressure was mentioned as one of the major reasons of boys using more technologies than girls. Hanging out together and the way boys and girls spend their leisure time, have a direct influence on individual behaviors. There is a feedback effect of leisure time stereotypical gender behaviors, group practices and individual preferences. If most of the boys talk about and play computer games, it is more likely that a young boy is more willing to like computer games than girls. Participants consider that when girls are in groups they spend most of their time talking and sharing information, and in this context online social networks are important. However, technology in girls' leisure time activities is seen as a support of the main interest: communicating.

The boys hang out with boys in class breaks, and they play together, if one is playing a game on the mobile phone the others also want to play it. People influence each other and we all try to please out friends so if they like to play online games we also start to play them, to have things in common, to share. Participant 12, Boy, 14 years old

Girls spend a lot of time in social networks because they like to talk with their friends, in school they stay in groups with other girlfriends and chat a lot, they like to chat a lot, they all tend to do the same. Participant 7, Boy, 14 years old

Considering the use of technologies as a profession, students highlighted the importance of the social context. It is more likely that a boy or girl feels more attracted to a profession if there are more men or women, respectively. On the contrary, if a profession has a majority of men or women it may not be appealing, or it can even be intimidating.

There are more women working with small children, they are more patient and because they are mothers it is easier for them. Participant 5, Boy, 14 years old

If a girl goes to a course with almost only boys I think it is intimidating and uncomfortable, I would not want to be in that situation. Participant 8, Girl, 14 years old

Gender stereotypes came forward during the focus groups, students reproduced normative ideas of how women and men are like, what they prefer and how they interact with technologies. Stereotypes are not easily disrupted. One of the boys that participated in a focus group identifies his mother as more technological competent than the father, and she was the one who taught him how to use a computer. Nevertheless, this boy did not question or hesitated to identify men as more technologically competent.

The way students identified gender practices and justified gender technological preferences illustrate how gender stereotypes are materialized in technology. In the discourse of the participants in focus groups, gender markers correlate to technology usage.

I think that women are more interested in practical things, things like taking care of the home, not using computers and things like that. Participant 6, Girl, 14 years old

Women usually want to have children and take care of them and men have more free time, and companies will probably prefer to hire men than women, because women get pregnant. Participant 11, Girl, 14 years old

Men also have children but is the woman who gets pregnant, it is different, and women have that time of the month…. Participant 5, Boy, 14 years old

The idea that women are less interested and competent in technologies than men is justified based on both biological and social gender markers. Gender relations are materialized in technology in the discourses of the participating students, disclosing that their concepts of gender and technology are mutually constitutive.

V. Conclusions

The cross analysis of the 'Gender&ICT' results of the research with preschool children and teenagers of the 9th grade, evidenced that in these different stages of psychological development and gender identity, there are similar stereotyped representations on ICT and gender

Young children reproduce gender stereotypes and direct experience is of utmost importance to support diverse gender representations. The few kindergarten children who expressed non-stereotyped opinions, for example, woman repairing a computer, have direct experience with adults who scaffold the diversity of gender representations.

The 9th grade students' results reveal how gender stereotypes are deep-rooted amongst young people, in a time of their lives when they have to make academic choices that lead to professional careers. Gender stereotypes can influence and determine the future educational and professional choices of young people, contributing to maintain the stereotypes, in a cyclical process. Schools have an important role to disrupt this cyclical process, supporting the diversity of students' interest and encouraging both girls and boys to further develop their technological competencies. At the same time it is important to disrupt gender stereotypes in other areas, such as kindergarten education, by supporting boys to engage in caring professions. It is not just about technologies, it is about gender stereotypes and what is expected of boys and girls.

At a time when so many gender stereotypes are being challenged in western societies, gender binaries are questioned and diverse ways of performing gender are increasingly visible, it is somehow surprising that these results evidence such a strong prevalence of gender stereotypes amongst young people. On the other hand, nowadays girls are using ICT intensively, such as mobile phones and the Internet, however, it seems that the preconceived idea of how women and men use technology remains untouched.

The next phase of 'Gender@ICT' research will explore the ideas and experiences of ICT teachers with both girls and boys using technology. ICT teachers have a privileged insight on young people digital practices, their views will be complementary to the results of the focus groups and class activities with children and young people. The semistructured interviews with ICT teachers will also contribute to identify educational practices that promote gender equity in ICT.

The school has a major role in promoting gender equality by providing diverse gender representations to children from all sociocultural contexts. In particular, school can make the difference to children who do not have access to a diversity of gender representations at home. It is urgent that gender equity becomes central to education. By gender equity we are not referring to equal numbers of men and women using technology, but as expressed by OECD [6], to greater levels of self-determination for all genders, a much greater range of opportunities for being gendered and more equal distribution of power.

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