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Education and Digitalisation: Can New Technologies Benefit Girls' Education in Developing Countries?

Author: Nina Fuiko
Supervisor: Victoria Enkvist

Abstract

The text deals with the matter of digitalisation and the right to education in the developing world and the potential effects for girls and young women specifically. By examining the influence that new digital technologies have had in the sector of education as well as how they might be implemented in areas where they are at present time not as widely available, the text provides insights into the many layers and aspects that need to be considered within an educational system. Advantages for girls can be achieved if their specific, often disadvantaged, situation is taken into account and changes are made in such a way that does not perpetuate existing inequalities and is mindful of challenges presented by digitalisation.

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1. Introduction

"Everyone has the right to education" - Universal Declaration of Human Rights 1948.[1] Despite decades of effort to provide proper education to children in all circumstances all over the world there are still high numbers of children who are not able to attend school or receive subpar education even if they are in school. With the fast advancement of digital technologies which are ever progressing, particularly, in first world countries and wealthier spheres of developing countries the risk of an even greater divide in many aspects of live but especially in education arises. It is undeniable that digital technology such as information and communication technologies have become an integral aspect of everyday life in many parts of the world and their impact can be expected to expand further in the near future. Therefore, it becomes necessary to consider how big a part they should have when considering the future education of children, seeing as the use of digital devices seems almost inescapable. Thus, being familiar with various applications and comfortable with their use is basically a prerequisite to enter the job market and have a chance at a successful career. While there are many projects that deal with encouraging technological education, especially in the field of coding and at a higher educational level, little consideration seems to have been given to using the very basic functions of these technologies to promote basic education.
In addition, digital devices are not only tools that simplify or speed up tasks and processes of everyday life, they can also be a tool of great expansion which have the possibility to significantly enhance many aspects of society, not least education. So far it seems as though many educational systems merely use information and communication technology (ICT) to facilitate current teaching methods. However, there are many possibilities to use digital technology to broaden educational input and methods of imparting knowledge as well as opportunities to foster individualized and independent learning.

Another aspect to consider is that the field of modern technology, which is closely linked to the hard sciences and has such a huge impact on the modern world and its advancement, is a male dominated field.[2] Considering that particularly in poorer countries girls in education are

[1] *Universal Declaration of Human Rights,* (UDHR) (adopted 10 December 1948) UNGA Res 217 (A)
[2] "Women in Computer Science: Getting involved in STEM", ComputerScience.org, 5.May.2021 https://www.computerscience.org/resources/women-in-computer-science/#:~:text=Despite%20the%20high%20job%20demand,to%20pursue%20computer%20science%20degrees. accessed on: 23. June.2021

at a disadvantage due to societal reasons anyway, this issue is something that needs to be kept in mind so that by anticipating it, it can be prevented from enhancing already existing gender gaps even further. Moreover, recent events have brought new matters to attention. The Covid-19 crisis and its consequences such as having to isolate from others and participate in distance learning have shown how much students can profit from a working technological infrastructure, but also how fragile some education systems are and how millions of children missed valuable education time, because they did not have any access to the necessary tools.

Under these circumstances it becomes important to consider, not only if all children have the possibility to go to school and receive and education, but also what kind of education they receive and whether or not, what and how they are learning, is line with fulfilling the rights guaranteed to them under several human rights treaties. According to General Recommendation No.36, the two critical education targets to be met in accordance with the 2015 Sustainable Development Goals are: "(a) ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes; and, (b) eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations".[3]

In this thesis I am going to explore if the use of digital technologies including ICTs can be used to benefit girl's education in developing countries and what challenges might exist in this field. Often, when thinking about the possible uses of new technologies it is immediately assumed that it has to be the most current or multifunctional device that is employed to make the effect as progressive as possible. However, when aiming to enhance the education in very simple schooling environments, basic and simple but functional devices can already make a great difference. The aim is to explore these technological possibilities with regard to how they can be instrumentalised in enhancing girls' learning experience while simultaneously familiarizing them with the skills needed to succeed in on the job market. In addition, it is also imperative in relation to the equal benefit of female students, to consider how these changes towards a stronger inclusion of digital devices in education could be integrated in the development of future curricula, teaching systems, and educational policies in a gender sensitive manner. To this end, there will also be an exploration of how the use of digital

[3]Committee on the Elimination of Discrimination against Women, General Recommendation No. 36: On the Rights of Girls and Women in Education, (2017)

technology is handled and how all the multidimensional aspects of integrating new technologies into schools and teaching relate to the scope of the right to education and the quality of that education. Considering the shift towards an increasingly digitalized world skills such as digital literacy and basic computer skills have gained great importance and might soon be considered indispensable to quality education and therefore by extension the right to education.

In order to undertake this research, the main approach will be an analysis of implications of the current educational situation and its possible development in combination with technology. By incorporating different perspectives a qualitative method approach can be used to combine the data of qualitative research gathered from sources such as official documents and action plans, education policies, curricula, reports on current teaching methods, as well as insights from previous research and project reports from organizations which have implemented the use of technology in some instances, as well as previously conducted studies and some quantitative research particularly from studies with regard to the use of digital technology in education.

In advance of continuing this text it is necessary to address the use of the terms 'development' and 'developing countries' and potential issues and limitations concerning these terms. The labels 'developing nations' or 'developing countries' are very wide ones which encompasses many different states of the world. Many of these countries could also be differentiated with regard to their industrial capacity, political status, or implementation of human rights, as well as according to differences between growing urban areas and the more rural regions. Moreover, all of them are varied in their economic, political, social and cultural situations and the use of these terms is in no way intended to oversimplify these conditions or generalise in a manner which gives the impression that there is a simple, 'one size fits all' solution to certain issues. Nor is it intended to wrongfully generate the idea of these countries as the 'other' that has yet to reach the status of the 'developed world'. Therefore, when these terms are used, they shall mainly "reflect the unequal share of global wealth that persists between these countries"[4] and contributes to the vast differences in technological development which then in turn manifest themselves in issues such as lack of quality education without relevant and advantageous digital learning opportunities, which are the focus of this paper.

[4] Nordtveit, 2010, In: Neil Selwyn, *Education in a Digital World: Global Perspectives on Technology and Education*, London: Taylor & Francis Group, 2012, p.106

A second caveat to address with regards to the following text is the point of female as opposed to male students. Many of the educational aspects and potential changes discussed would of course benefit children from all genders. However, since young women and girls are still a group that is disadvantaged and marginalized in many aspects of life, including such a major one as education, it is imperative that their specific needs be taken into account at every step. This is in no way meant to diminish potential issues and disadvantages which may affect male students more than female ones, but merely aims to indicate how the implementation of digital technologies offers an opportunity to address some of the issues that have for so long been a detriment to young girls and women.

2. Methodology

The research approach applied for this thesis was a qualitative research methodology with the aim to examine separate aspects of the issue and gain a deeper understanding about how they relate to and influence each other.In order to understand if and if so how digitalisation and new technologies could contribute towards the realisation of the right to education for girls and young women in developing and low income countries a wide range of qualitative data was consulted.

To collect the data extensive research was conducted into the field of education and technology, digitalisation and its impact in different parts of the world, as well as gender disparities related to those subjects and their connection to the right to education and equality. Materials included the relevant human rights instruments and texts, scientific as well as news articles and studies from peer reviewed journals, extensive literature by expert scholars as well as reports and publications from international institutions and agencies such as Human Rights Watch, UNESCO and other United Nations' organs.

When it came to the sources pertaining to education and technology, particular focus was placed on using predominantly sources which were written no later than 2012, since the field of digital technologies is changing so rapidly that matters can evolve drastically even within the span of a decade and when considering issues or findings from too long ago one would risk referring to issues and technologies which have since become outdated. The materials were then analysed and interpreted in terms of content and findings with the aim to gain insight into the subject and identify recurring themes and patters.

The qualitative reattach approach was chosen because, while some matters such as student enrolment in school or increasing digital literacy can be measure in numbers, there are many

social, cultural and potentially even political layers to the matter, which are not easily quantifiable. In addition, the field of 'developing' or 'low-income' countries is such a wide one that it would be to wide of a stretch to measure and compare statistics and numbers for such a varied and large amount of countries. Another potential constraint was the access to certain data such as limited amounts of documentation concerning specifically girls and young women in correlation with digitalisation and education in developing countries, in addition to possible language barriers for local publications. Nevertheless, insights could be gained as the focus lay on the specific issue of gender aspects within the larger field of technology in education.

3. Background

3.1. Equality in Education

"The importance of prohibiting discrimination in education should be self-evident. Non-educated persons may be denied access to a variety of employment situations, may not be able to exercise democratic rights […] and may, ultimately, become second class citizens."[5] Nevertheless, inequality in education is a widespread issue. It can occur in the form of varying levels of education within the school system of one country or be due to big differences of educational system of individual states. Of course, some of these differences are simply circumstantial and certain inequalities must occur since no two situations are ever exactly the same or even similar. However, there are certain inequalities which have clear reasons and need to be addressed and combated. One such issue is the lack of equality and a gender bias when it comes to boys and girls.[6] General discrimination due to stereotyping within school settings which are an extension of all the other aspects of discrimination of women, influence girls' experiences at school. Persistent patriarchal systems and cultural norms which perpetrate a certain image of women, lead to biases in teaching, with regard to certain subjects or girls' treatment from the faculty members and can amount to a significant barrier that keeps girls and young women from enjoying their right to education.[7] Even harassment in school or on the way there is no seldom occurrence.[8] In addition, there are certain problems girls in school settings face, simply because of the circumstance of being female. The need for sanitary facilities to be able to visit school at any time of the month, or

[5] Rhona Smith, *International Human Rights Law* (9th Edition), (Oxford University Press, Oxford, 2020), p.393-394
[6] Smith, "International Human Rights", p. 398
[7] General Recommendation No.36, p.12
[8] General Recommendation No.36, p.15

the dangers of early marriage and pregnancy that lead to an early drop out from school, are specific problems for girls.[9]

While problems of inequality in education can occur in every part of the world, they are especially prevalent for girls in developing countries. Now, the process of digitalisation and the introduction of new technologies which is gaining more relevance every day, is a new factor to consider within the field of education and its problem with equality. There are several factors which put young girls in third world countries in particular danger when it comes to realization of their right to education. In addition to facing all the prevalent discrimination against women, which are often even more prominent in developing countries, they are also dealing with a schooling system which is likely to be on the lower end of the quality scale, potentially hard to reach, and still in various stages of development and improvement. Moreover, many families in low income countries may lack the money to send all of their kids to school (usually to the detriment of female children[10]), or are afraid to let their daughters go, because leaving the house means entering an unsafe environment. However, even if the environment is safe, it is rapidly changing. Developing countries cannot escape the influence of the new technologies which are taking other parts of the world by storm and despite poverty and financial differences some kind of digitalization process will reach every part of the world sooner or later. It is this influence, therefore, that warrants some more attention. Accordingly, statements can be found in the Sustainable Development Goals where target 4.7 is "By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, […] human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development" [11] and 5.b reads "Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women"[12].

3.2 The prominence of digital technology in our world

[9] General Recommendation No.36, p.12

[10] Plan International France and French Ministry for Europe and Foreign Affairs and UNESCO, Beijing+25: generation equality begins with adolescent girls' education, 2020, p.12 https://unesdoc.unesco.org/ark:/48223/pf0000374579 accessed on 12. June.2021

[11] "Sustainable Development, Goal 4", United Nations, Department of Economic and Social Affairs, https://sdgs.un.org/goals/goal4 accessed on 23. May.2021

[12] "Sustainable Development, Goal 5", United Nations, Department of Economic and Social Affairs, https://sdgs.un.org/goals/goal5 accessed on 23. May.2021

New digital technologies are rapidly evolving into one of the most influential aspects of people's daily lives and provide exiting and improved ways to conduct procedures and engage in activities. The positive impacts from the field of new technologies, particularly information and communication tools, in all areas of life, including human rights implementation, are undeniable, however, throughout excitement and a simplified view on the matter, possible risks which need to be addressed might be overlooked. However, they need to be examined if the implementation of new technologies is to be successful, because even in the 1960 when many of the technological advances were only in its beginning stages they were by far not developing as quickly and with such an impact as they are today the General Assembly resolution 2450 which among others mentions "*Sharing* [original emphasis] the concern expressed by the Conference that recent scientific discoveries and technological advances, although they open up vast prospects for economic, social and cultural progress, may nevertheless endanger the rights and freedoms of individuals and peoples and consequently call for constant attention,"[13], already seemed to be aware of the potential challenges concerning technology that we still concern ourselves with today.

An adverse aspect that has accompanied all the exciting and innovative digital novelties is the emergence of a 'digital divide' that is brought about by modern technologies. Due to their wealth and economic stability first world countries are in a much better position to embrace new technological advances. Institutions and companies as well as individual people are much more likely to be familiar or even in possession of new technological devices and systems, not least because first world countries are the places in which scientific research and technological development is mostly taking place. In contrast, developing countries which are already at a disadvantage in a number of ways, may face further challenges which prevent them from advancing and catching up to other areas in the world. In developing countries where financial means may already be lacking and the government has many issues it needs to addressed before the agenda can move on to matters of digitalization and implementing new technological advancements, it can create further pressure and add another aspect to the list of things that need to improve. Therefore, the benefits which arise from being able to profit from new technologies in first world countries put more distance between them and developing countries and exaggerate already existing inequalities that pose a danger to the economical and societal development of large groups of people. Moreover, this differentiation is not limited to the gap between wealthy and poor countries. In countries which are industrializing or have a newly growing economy it can

[13] United Nations, *General Assembly Resolution 2459 (XXIII)*, 19 December 1968

lead to a widening of the gap within the social strata, especially if there already is a noticeable divide between rich and poor social classes. Thereby, people who are already in a more vulnerable position than others are placed at an even bigger disadvantage of being excluded or discriminated against. Included in this danger which digitalization poses for marginalized groups is the fact that the sphere of technology and hard science is dominated by (mostly white) men[14]. This circumstance leads to the unfortunate outcome that many of the new technological advancements are largely suited to their needs and interests.

As previously established, women all over the world are already experiencing inequality opposite men. Even considering just the literacy rates among adults, out of the over seven hundred million illiterate people in world, two thirds are women[15], shows that there could be a huge problem that is easily overlooked when it comes to new technologies and digitalization. As reading is a major part of using many digital devices, belonging to the group of people who is more likely to be illiterate - women- means facing a huge obstacle toward even using the most basic of devices. Moreover, there are additional barriers because some women may have the ability to read but often have less access to the devices or lack digital literacy compared to men in similar situations. Furthermore, women are more likely to be affected by poverty, which means that even if they have the skill and the desire to use new technologies they might still lack the financial means and thus are missing out on being part of the progress, which in turn can again increase poverty.
Of course, this is not merely a problem concerning the realm of technologies but rather another issue with women's rights connected to areas such as the right to education. In fact, as can be seen, the two are actually quite closely linked since preventing new technologies from being implemented in ways which further exaggerate the issues of discrimination and inequality, we have to ensure that younger generations, especially girls, are given the opportunity and encouragement to learn and use new digital technologies, so that they too may be part of the emerging, increasingly digitalised, world. As the advancement of digital technology continues every day, their potential to be incorporated in education in a meaningful way must be examined. Specifically, when it comes to improving quality and equity in education digital devices may contain the capacity to be relevant tools for the future.

[14] "Diversity in Tech: We've Got a Long Way to Go", Recruiting Innovation https://recruitinginnovation.com/blog/diversity-in-tech/, accessed on 12. May.2021
[15] "Women ED facts and figures", UNESCO, http://www.unesco.org/new/en/unesco/events/prizes-and-celebrations/celebrations/international-days/international-womens-day-2014/women-ed-facts-and-figure/#:~:text=EVIDENCE%20%E2%80%93%20ILLITERACY%20IN%20THE%20WORLD,youth%2C%2076%20million%20are%20female. accessed on 16. April.2021

Digital tools are not only a potential issue, they also have the potential to be tools to realize the right to education specifically when it comes to quality and equity. The scope of the right to education like all the other rights has widened over time and now has been many components which reach far beyond the mere possibility to attend some form of schooling. In General Recommendation No. 36 it is clearly stated that „[e]nsuring this right [to education] warrants attention to physical, *technological* [added ephasis] and economic access[16].
As asserted by Coomans "the right to education implies the right to quality education, that is education that is available, accessible, acceptable and adaptable to the needs of learners"[17] all of these four aspects could potentially be aided by technologies and could have great positive impact if implemented in a thoughtful and relevant manner.
Naturally, this has not gone unnoticed and as can be seen in the Global Education Monitoring Report of 2020[18] and the Framework for Action for the Implementation of SDG 4 where it is stated that "Innovation and ICT must be harnessed to strengthen education systems, disseminate knowledge, provide access to information"[19] the initiative has been made. However, in both instances the technology such as ICTs are only vaguely mentioned as something that needs to be incorporated but the 'when', 'where' and 'how' remain elusive. Furthermore, particularly within the Action Plan for the SDG the focus for ICT inclusion seems to be placed on the upper secondary and tertiary education. Meanwhile, there are many indications that early familiarization and learning with and about new technologies is more beneficial or even necessary for the best results. To be explored in the next section of the text, are the benefits but also the potential dangers to be considered when aiming to introduce and expand the use of digital technology as a means of enhancing education as well as within itself being a subject worth exploring for future professional potential.

3.3. Scope of the Right to Education

[16] General Recommendation No. 36, p.7
[17] Fons Commans, "Identifying the Key Elements of the Right to Education: A Focus on Its Core Content", https://archive.crin.org/en/docs/Coomans-CoreContent-Right%20to%20EducationCRC.pdf, accessed on 1.April.2021, p.7
[18]UNESCO. "Global Education Monitoring Report Summary 2020, Inclusion and education: All means all". Paris: UNESCO, 2020, https://unesdoc.unesco.org/ark:/48223/pf0000373721, accessed on 29 . May. 2021
[19] "Incheon Declaration and Framework for Action for the Implementation of Sustainable Development Goal 4", 2016, https://unesdoc.unesco.org/ark:/48223/pf0000245656/PDF/245656eng.pdf.multi accessed on 14. March.2021

The right to education has been a fundamental part of the human rights discourse since the very beginning when human rights, in the form as we know them today, first emerged after the second world war. As many other rights it has been expanded over time and come to be interpreted in ways that are in keeping with the developments of the world and the current times. With digital technologies becoming such a prominent aspect of information access and communication between people all over the world it is only natural that it should eventually become an element to consider within the realm of the right to education.

The right to education was first stated within Article 26 of the Universal Declaration of Human Rights in 1948 stating that "Everyone has the right to education" which "shall be directed to the full development of the human personality and to the strengthening of respect for human rights and fundamental freedoms"[20]. Following this, it is recorded in the International Covenant for Economic Social and Cultural Rights Article 13 and 14[21] as well as in the Convention on the Rights of the Child Article 28 and 29[22] . Most provisions are similar, although, there are some differences such as the provision of the CRC referring to children's education specifically. Furthermore, additional documents such as General Comments or Recommendations drafted by the appropriate comities are available and provide insight on the interpretation of the right. General Comment No. 13 on the implementation of the ICESCR as it concerns the right to education offers a broad body of reference as to how this right is to be understood[23]. Since the right to education is intricately linked with other rights there are also documents which deal with more than just the isolated issue. An important one is the intersection of women's or girls' rights and the right to education which is dealt with in General Recommendation No. 36[24] in which the issue of girl's and women's rights to education specifically is being raised.

What the right to education entails at its core is of course stated in the corresponding provisions, however, other essential elements that follow from these provisions are the four

[20] Universal Declaration of Human Rights
[21] International Covenant for Economic Social and Cultural Rights, (ICESCR), 1966, opened for signature 16 December 1966, entered into force 1976.
[22] Convention on the Right of the Child (CRC), 1989, entry into force 1990, p.9-10
[23] Economic and Social Council, General Comment No.13: On the right to education (Art. 13 of the International Covenant on Economic, Social and Cultural Rights), (2003)
[24] See: General Recommendation No.36

'A's namely: Availability, Accessibility, Acceptability, and Adaptability[25]. In short this means that "functioning educational institutions and programmes have to be available in sufficient quantity", they have to be "accessible to everyone, without discrimination", this includes physical and economical accessibility"," form and substance of education, including curricula and teaching methods, have to be acceptable (e.g. relevant, culturally appropriate and of good quality) to students" and "education has to be flexible so it can adapt to the needs of changing societies and communities and respond to the needs of students within their diverse social and cultural settings".[26] As the demands of the world grow and change with developments and achievements, so does the demand for a kind of education which is in tune with the current times and prepares its students for life outside of the education system. Accordingly, the right to education has also developed with regards as to what it needs to encompass in light of what it needs to provide so that the right is adequately protected. This pertains especially to a more abstract element of the right to education which is quality of education. Measurable learning outcomes, quality of teaching materials, infrastructure of school buildings, inclusion of education regarding technology and science are just some of the elements which need to be considered to asses this matter.[27] The duties of the states on this matter require that they "provide and maintain this quality level, otherwise attending classes would be meaningless"[28].

An undeniable and highly significant aspect of the right to education is its being a prerequisite to the enjoyment of other rights. Most notably, when it comes to equality. "As an empowerment right, education is the primary vehicle by which economically and socially marginalized adults and children can lift themselves out of poverty and obtain the means to participate fully in their communities"[29]. Basic skills such as numeracy skills and literacy which are delivered by an adequate education are very valuable when it comes to accessing health care, participating in public and political life and live as independently as possible without disadvantages due to the lack of basic knowledge. In a case from 1993 the Supreme Court of India even "held the right to (primary) education to be implicit in the right to life because of its inherent fundamental importance"[30].

[25] General Comment. No. 13, p.9-10
[26] General Comment. No. 13 p.9-10
[27] Coomans, "Key Elements", p. 7
[28] Coomans, "Key Elements", p. 7
[29] General Comment No.13, p.7
[30] Unni Krishnan and Others v. State of A.P. and Others, 4 February. 1993, (1993) 1 SCC 645. (India), In: Coomans, p.4

As such it also connected to the issue of advancing technologies and how they are or should be incorporated into educational practices and moreover, how girls specifically need to be considered within this development concerning their potential disadvantage and higher risk of exclusion. “The digital environment can greatly enable and enhance children’s access to high-quality inclusive education, including reliable resources for formal, non-formal, informal, peer-to-peer and self-directed learning.”[31] When investing in the school system states should pay attention to infrastructure necessary to the use of modern technologies such as high-quality broadband and sufficient access to computers devices as well as divers and current learning materials on these devices.[32] Since accessibility to educational institutions is an important element which often poses a problem especially when it comes to the safety of girls and women, physical access is made less vital if information and communication technologies can be employed. “These approaches provide distinct benefits for girls and women with limited access to conventional forms of education and training, including those who are excluded because of: distance from school in rural areas; domestic work and parental responsibilities, particularly in cases of child marriage and adolescent pregnancy; and, exclusion based on other social and cultural barriers.”[33]

Lastly, it is necessary, to state that of course not all rights are the same in all places of the world. Be it due to the margin of appreciation of an individual state party, or lesser capability to provide as high a standard as other countries due to economic, financial or security reasons. However, the right to education should always rank high on any governments priority list and the quickly evolving digitalisation of the world not to be underestimated and therefore, considered in decisions concerning education.

However, as it is stated in General Comment No. 13 “education has to be flexible so it can adapt to the needs of changing societies and communities and respond to the needs of students within their diverse social and cultural settings.”[34] Considering the current developments in digitalisation, it stands to reasons that in the not so distant future basic skills surrounding the use of computers or similar devices such as tablets will be an indispensable tool for learning,

[31] Committee on the Rights of the Child, General Comment No. 25: On children’s rights in relation to the digital environment, (2021), p. 17
[32] General Comment No. 25, p. 17
[33] General Recommendation No. 36 p.8
[34] General Comment No.1 3, p.10

accessing information and succeeding on the job market and as such will have to be included within the foundation of education and its accompanying right.

4 . Digital technology and education: Benefits that are known so far and the incorporation of such a multidimensional matter in education systems in the developing world

4 .1. Benefits of incorporating digital technology in education

As new technological advancements steadily entered and increasingly influence people's lives, it was only a matter of time until they started to influence the field of education. Eventually so much so, that the European Commission introduced a digital education action plan that acknowledges the importance of encouraging the use of technologies in education in 2018[35]. At the beginning when digital technologies were first starting to be introduced, people were often divided into groups of strongly pro or decisively against the implementation of new technologies in schools and other educational facilities and considering the contrary or inconclusive results that accompanied earlier studies on the matter, there was basis for both opinions. For example, when the 2010 OECD[36] report mentioned on the one hand that computers could be linked to positive performance in science and on the other hand also linked higher performance in science to lower use of computers. However, technology kept evolving and so did the modes of implementation and more recent studies are clearly indicating the ways in which technology such as ICT can be beneficial in education. Some of the most prominent findings will be shortly outlined in the following.

One major aspect in the findings points toward a more active and constructive way of learning. The internet and its access through ICTs leads to a seemingly endless source of information. While this has many benefits it also means that the ability to recognise and distinguish relevant and reliable information from unreliable or false one gains importance. As shown by Brush et al. the incorporation of ICT and learning how to find the correct information leads to enhanced critical thinking and creates a shift from passive learning to

[35] European Commission, *Communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions on the digital education action plan,* 2018b,

[36] Center for Research and Innovation, "Are the new millennium learners making the grade? Technology use and educational performance in PISA," Paris: Organization of Economic Cooperation and Development, 2010

active problem-solving tasks [37]. Moreover, it creates broader understandings, because due to its multidimensional aspects "technology can take fit-for-purpose forms addressing a wide variety of learning needs like, for instance, collaborative learning, even in distance-learning environments"[38]. It also promotes what Criollo-C et al. term „Constructivist Learning" which designates "[a]ctivities that encourage learners to actively construct new ideas or concepts based on their prior and current knowledge" and how "[m]oblile technology offers new learning opportunities extending beyond traditional activities, allowing participation, challenge, and competition of participants"[39].

The next positively enhanced aspect is a more informal and autonomous way of learning. Learners have more control over the learning resources and can employ them in a more autonomous, freely chosen manner which is akin to their own interest and needs at that moment [40]. Such possibilities lead "to students feeling more confident in dealing with otherwise passively transmitted knowledge"[41].

There are also benefits for teachers and schools. First and foremost, "a more flexible, timely and easy distribution of the learning material"[42], but also the possibility to work with current tools that students find appealing and that have the potential to contribute to a more interactive and engaging teaching style. "Some free commercial tools allow instructors to quickly create and implement their course content"[43]. In addition, as shown by the recent worldwide pandemic, a working digital infrastructure is a significant asset within distance learning and the provision of materials to students who are not able to attend school physically.

Another, very important, factor is that ICT in education can advance equal opportunities if designed and implemented correctly. "Online, digital libraries, virtual labs, collaborative tools

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[37] Brush,T.,Glazewski, K.D.and Hew,K.F., Development of an instrument to measure preservice teachers' technology skills, technology beliefs, and technology barriers.

[38] Foutsitzi, Sotiria and Caridakis George, "ICT in education: Benefits, Challenges and New directions," *2019 10th International Conference on Information, Intelligence, Systems and Applications (IISA)*, 2019, pp. 1-8

[39] Criollo-C,S.; Guerrero-Arias, A.; Jaramillo-Alcázar, Á.; Luján-Mora, S., "Mobile Learning Technologies for Education: Benefits and Pending Issues". *Appl. Sci*. 2021, 11,4111. https://doi.org/10.3390/ app11094111

[40] Denk, Michael, Weber, Michael; Belfin, Roland, "Mobile learning—challenges and potentials", *Int. J. Mob. Learn.* Organ. 2007, 1, 122–139.

[41]Smeets E, Mooij T. "Pupil centred learning, ICT, and teacher behaviour: observations in educational practice". *British Journal of Educational Technology*. 2001 Sep;32(4):403-17. In Foutsitzi & Caridakis, 2019, p.2

[42] Foutsitzi & Caridakis, "ICT in education", 2019, p.2

[43] See: Rimale et al. (2016) and Haag (2011), In Criollo-C and others, "Mobile Learning Technologies", 2021, p.8

and online thesauruses of knowledge are nowadays more accessible than ever. […]Open access requires that academic knowledge is widely and freely available online, permitting equal, free access to everyone"[44]. However, in this regard particularly, it is important to remember that this equal access should not be taken for granted. Pre-existing inequalities such as unequal access to devices can invert this effect.

Moreover, the use of ICT in education can combine a broader variety of ways by which to convey or impart material and the combination of text, image, video and audio leads to an enhanced attention and understanding towards the learning material[45]. This is what Foutsitzi and Caridakis term "more attractive learning"[46]. They also state that "the combination of different sensorial cues aims also at higher degrees of personalisation, since different individuals place different importance on different sensory channels in the way they filter information while learning"[47]. When a learning style is more "attractive" the student is also more likely to be motivated. The possibility to choose between multiple 'learning paths', which is part of the general functions when using mobile technologies, also enhances the chance of creating fun, interesting and accessibly ways of education[48]. Furthermore, the use of mobile technology creates the option set up a learning space other than just in a classroom. It can be done out of doors, in an authentic setting aligning with the learning content and online in the form of discussion forums, for example.

The use of new technologies within education also shows changes within student behaviour. As ICT often includes methodological approaches that include project-based learning or working in groups[49], their inclusion can "enhance learning through collaboration, and m-learning could also help create more personalized learning experience"[50]. This also relates back to the previously mentioned aspect of more "attractive" and motivational learning.

Last, but decidedly not least, is the affordability, portability and flexibility concomitant with many new technological devices. "Intrinsic characteristics of mobile technology provide

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[44]Foutsitzi & Caridakis, "ICT in education", 2019, p.2

45 Carney RN, Levin JR. Pictorial illustrations still improve students' learning from text. Educational psychology review. 2002 Mar 1;14(1):5-26

46 Foutsitzi & Caridakis, "ICT in education", (2019, p.2)

47 Foutsitzi & Caridakis, "ICT in education", (2019, p.2)

48 See Dingli, A.; Seychell, D. The New Digital Natives; J.B. Metzler: Stuttgart, Germany, 2015.

49 Haydn T. Signature pedagogies, assumptions and assassins: ICT and motivation in the history classroom. In Using New Technologies to Enhance Teaching and Learning in History 2013 Feb 11 (pp. 141-152). Routledge.

50 Criollo-C and others, "Mobile Learning Technologies", p.8

access to learning that might not otherwise exist."[51] When someone is in possession of a mobile device with some form of internet access, they can access information and learning materials from many locations and in various situations.

Furthermore, new innovations are never a long time in the coming. "We are currently witnessing the emergence of a number of AI-oriented solutions with specific relevance to the educational sector, for example, recently the results of AI research have been translated into a tool used to identify and determine reading difficulties in children" as well as a predicted strong influence of virtual and augmented reality devices for the future[52].

4.2. Multidimensionality

"Meaningful access to digital technologies can support children to realize the full range of their civil, political, cultural, economic and social rights."[53] However, digital technologies in education are a multidimensional topic which needs to be examined from multiple points of view. Truly successful implementation for male and female students alike, depends on advancement and cooperation between all the varying aspects. "The absence of this right [the right to education] is particularly evident when education, which should be transformational, fails to significantly advance the position of women in the social, cultural, political and economic fields thereby denying their full enjoyment of right in these arenas".[54] A crucial issue in this matter is that gender disparities in many developing or low income countries might already be present at many levels of the education system. If the implementation of new digital technologies is meant to help eradicate discrimination instead of enhancing it, then consideration must be given to the situation of girls and young women at every step of the way.

If executed successfully, then it would not only benefit the enjoyment of the right to education, but by extension also "[r]ights through education [that] define ways in which schooling shapes rights and gender equality in aspects of life outside the sphere of

51 Sattler et al. 2010 and Özdogan and other, In Criollo-C, "Mobile Learning Technologies", p.8
52 Andres Laya and Jan Markendah, "Solutions based on digital connected devices for social care and well-being", In: Larsson, A., & Teigland, R. (Eds.), Digital Transformation and Public Services: Societal Impacts in Sweden and Beyond. Routledge. 2019. https://doi.org/10.4324/9780429319297 p.147
53 General Comment No. 25, p1
54 General Recommendation No. 36, p.4

education."[55] "However, if digital inclusion is not achieved, existing inequalities are likely to increase, and new ones may arise"[56]. The following section explores the different levels of the educational process that hold meaningful significance within the implementation of digital technologies and shows which matters need to be considered to ensure that young girls in school have a chance to benefit fully from the new developments.

4.2.1. Schools potential infrastructures and the means to finance them

When striving to implement new technologies in educational institutions many basic conditions need to be met. Most fundamentally stable electricity followed by functional devices such as laptops or tablets and ideally internet access. If these conditions are not given, making changes to provide them can be a substantial financial feat. This raises the question of financing and its potential issues. Considering Art. 14(d) (CEDAW)[57], General Recommendation No.36 states that "*access*[original emphasis] to education institutions must be within girls and women's safe reach, either by ensuring that they are accessible at some reasonably convenient geographical location or via modern technology"[58]. It also goes on to assert that providing alternatives to education with physical presence through the use of ICTs in distance learning can offer "distinct benefits for girls and women with limited access to conventional forms of education […] because of: distance from school […]; domestic work and parental responsibilities; and, exclusion base on other social and cultural barriers".[59] On the matter of financing and private actors it is recommended that private actors involved in educational institutions are required to respect standards regarding non-discrimination of girls in the same way that public institutions have to[60] and General Comment No.13 stresses that "in particular, the international financial institutions, notably the World Bank and IMF, should pay greater attention to the protection of the right to education in their lending policies, [and] credit agreements" [61].

[55] General Recommendation No. 36, p.4
[56] General Comment No. 25, p.1
[57]Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), United Nations General Assembly, adopted in 1979, Art. 14
[58] General Recommendation No.36, p.7
[59] General Recommendation No.36, p.8
[60] General Recommendation No.36, p.9
[61] General Comment No.13, p.23

4.2.1.1 The necessary infrastructure

The most essential prerequisite for using any sort of digital device is electricity. If that is given the other aspects such as connecting to the internet and charging various devices fall into place more easily. If it is not given that points to a general lack of modern infrastructure which is a problem beyond just the implementation of new digital learning devices and is probably already an issue which the authorities are aware of and hopefully in the works of changing. However, a lack of connection to electricity does not mean that there is no way of using digital devices. A project called 'Mobile Learning Lab' by the *60 million girls foundation* was designed to work under just those circumstances[62]. In order to charge the devices, they provided, they also delivered a "solar charging system, which consisted of 3 solar panels, 3 rechargeable batteries and 3 charging discs"[63]. When full, the solar charging system can charge 27 devices at once, it will take about three hours for a device to be fully charged, which can be done twice before the charging station is drained completely[64]. Once the charging system's batteries are completely empty, it will require 5 hours until it is fully charged again during dry season and somewhat longer during rain season depending on the weather conditions.[65] The cost for such a loading station is approximately 195 euros.[66] Such logistically simple but effective solutions which may not seem obvious when first considering the lack of electricity really have the potential to make a difference. They are easier and quicker to install then a power supply line and are a valuable advancement in general as they can bridge the time until adequate infrastructure is implemented and even after the fact could still serve as a backup in case the electricity supply is unstable or there are power cuts for whatever reason.

Availability of internet connections vary from region to region and household to household. With the rise of big phone companies also providing mobile data it might be easier for

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[62] "The *60 million girls* Foundation designed a Mobile Learning Lab (MLL) to provide up-to-date, high-quality learning materials for children in remote villages that have limited (if any) access to the Internet or electricity" (p.3). "It is a tool that can be used in a variety of learning applications where access to the Internet and electricity are either limited or unavailable. The MLL provides offline educational resources" (p.5). It consists of three components: the RACHEL (Remote Area Community Hotspot for Education and Learning) which is a portable plug-and-play server that stores educational websites, a certain amount of user devices (laptops or tablets), and a charging system. (see: *60 million girls* Foundation, Mobile Learning Lab Project Evaluation report – Sierra Leone, 2018)

[63] *60 million girls* Foundation, Mobile Learning Lab Project Evaluation report – Sierra Leone, 2018, https://60millionsdefilles.org/wp-content/uploads/2019/03/Project-Evaluation-Report.pdf p.6

[64] *60 million girls*, "Mobile Learning Lab", p.6-7

[65] *60 million girls,* "Mobile Learning Lab", p.6-7

[66] *60 million girls*, "Mobile Learning Lab", p.7

individuals to be connected to the internet, although it is difficult to make general assumptions about how this may affect the use of digital devices in an education setting, since the factors as so varied. Some students may be able to access the internet via their mobile phones, others may not. The school could have internet access, but that does not mean that it is possible to provide all students with a connection at all times. In such cases it would be up to the teacher to make decisions about how best to use the available resources. In general, there is of course no denying that the possibility to access the internet and all the information it holds is an invaluable tool for teaching and learning and that in the pursuit of quality education it should be a goal to provide educational facilities with the necessary infrastructure to make this possible. However, returning to the example of the project of the Mobile Learning Lab, which was designed for the most challenging circumstances, a solution to a potential lack of internet is the use of a portable plug-and-play server. The device used, called the RACHEL (Remote Area Community Hotspot for Education and Learning), is a battery-powered device which can store offline copies of education websites such as Project Gutenberg, Wikipedia, or Khan Academy, and therefore make them available for immediate access to free educational material without requiring internet access (www.worldpossible.org). It is very simple to use, and students can connect to the device via any laptop, tablet or smartphone through a local offline wireless connection without installing any additional software.[67] Solutions like these are dependent on technological developers to consider specific needs of people in areas with very limited technological infrastructure and not just go off of what has been used in more developed countries.

The digital devices themselves are the most varied aspect in the process. There are personal computers, laptops, tablets and smartphones all of which have different advantages. While computers which belong to the school and remain there have the benefit of being provided for the students by the school, therefore would not require them to pay for them themselves, and are sturdier and generally connected to electricity and internet, laptops tablets and smartphones have the distinct advantage of being portable and thereby provide a lot more flexibility and possibility of use. In-between these portable devices there are also differences in practicality of use, as a device with a keyboard is easier to write on and a tablet has a bigger screen than a smartphone. Nevertheless, any kind of access to digital devices is better than no access at all and projects of different kinds have shown promising results. Once again the Mobile Learning Lab can be given as an encouraging example of how digital devices can

[67] *60 million girls*, "Mobile Learning Lab", p.5

successfully be implemented: "Grade 4, 5 and 6 students in rural northern Sierra Leone saw significant increases in math and literacy outcomes compared to control groups following access to the [Mobile Learning Lab] for even as little as two hours per week over 16 weeks"[68]. The Worldreader project, for which e-readers that had multiple books uploaded onto them and were distributed to schools and libraries in developing countries with the purpose of enabling children to read independently, also showed that such an initiative using ICT can improve children's skills. According to the project report it resulted in improved reading proficiencies and an increased interest in books.[69] However, it cannot be denied that merely providing a device is not enough. The widely implemented 'One Laptop Per Child' (OLPC) initiative showed that the effectiveness of the project depends not just on the availability, but also on the use and incorporation of the devices into lessons.[70] While "[t]he result of pilot study on the OTPC in 2011–2012 in Thailand showed that students' listening, speaking, and reading abilities had subsequently improved (ESDC 2013)"[71], Crista et al., who examined the OLPC programme in Peru, observed that there was "no evidence that the programme increased learning in math or language".[72] A possible explanation was that the applications mainly used by the children were ones such as the calculator, games and music as opposed to activities that might have an educational outcome such as reading the available books[73]. This combined with "the absence of a clear pedagogical model that links software to be used with particular curriculum objectives"[74] shows that how the devices are used and integrated into the lessons impacts the utility of their use.

While the availability of digital devices has obvious benefits for all students, girls in particular could profit from such a development. Since the chance of girls to attend school is often hindered by circumstances that make it difficult for them to physically attend school, being able to access materials through portable devices could be an important game changer. If female students had their own portable digital device they could continue learning even

[68] *60 million girls*, "Mobile Learning Lab", p.3
[69] Worldreader project: http://www.worldreader.org, http://cdn.worl- dreader.org/wp-content/uploads/2013/10/Midterm-Results-Study.pdf. accessed on 25. April. 2021
[70] Julian Cristia, Pablo Ibarrarán, Santiago Cueto, Ana Santiago and Eugenio Severín, "Technology and Child Development: Evidence from the One Laptop per Child Program"*, American Economic Journal: Applied Economics*, July 2017, Vol. 9, No. 3, (p. 295-320)
[71] Yoshihiro Tabira, and Francis Xavier Otieno, "Integration and implementation of sustainable ICT-based education in developing countries: low-cost, en masse methodology in Kenya". *Sustain Sci* 12, 221–234 (2017). p.223 DOI 10.1007/s11625-017-0422-8
[72] Cristia and others *"One Laptop per Child Program",* p.297
[73] Cristia and others *"One Laptop per Child Program",* p.297
[74] Cristia and others *"One Laptop per Child Program",* p.314

during such times when they have to remain home, be it due to reasons related to their safety, having to remain home for some time every month due to their periods, or pregnancy or other family related responsibilities. Ideally, they would have internet access and the possibility to interact with the teacher and access materials, but a device which allows access to pre-existing source of materials which can be downloaded onto the device and used later, in the vein of the method of the MLL project could still provide a useful alternative, when in class attendance is not possible. Additionally, if all students have their own personal device, it also eliminates the possibility of unequal access and use which could arise between boys and girls if there were only a few devices available and their use was not strictly regulated. Girls who are often under the impression that computers and science are more suited to boys than girls could feel less encouraged to use a computer and miss out on learning opportunities. In their study concerning the "connection between environmental aspects and girls' motivation towards technology education"[75] Virtanen, Räikkönen, and Ikonen found that "it seems insufficient to enable equal access for girls to study technology if they see technology as a topic connected to male gender stereotypes and something alien to women and girls"[76]. If changes in education system seriously aim to provide equitable quality education, factors such as girls' specific needs and ways to address them by providing suitable changes which take these needs into consideration should be implemented.

4.2.1.2. Who provides financing and why?

The first instance that is responsible for providing financing for a countries educational system is of course the state itself. The government decides and allocates funds for various sectors of society and can also influence the purposes the given financial means are to fulfill. However, if the monetary means of the state are limited, as unfortunately often is the case in developing countries, the available resources to fund and develop the education system can be quite limited. Moreover, even though states are under a conventional obligation to consider the right to education and its financial support a high priority that available funding should be given to[77], there seem to be few opportunities to control in how far this obligation is being

[75] Virtanen, Sonja., Räikkönen, Eija, & Ikonen, Pasi. "Gender-based motivational differences in technology education". *International Journal of Technology and Design Education, 25*(2), 197-211. (2015). p.209, doi:http://dx.doi.org.ezproxy.its.uu.se/10.1007/s10798-014-9278-8
[76] Virtanen and others, "Gender-bases motivational differences", p.207
[77] Coomans, "Key Elements", p.6

adhered to as due to certain circumstances, such as delays in reporting, or even economic instability or political change, transparency may be hindered. Moreover, when it comes to "actual change 'on the ground' the integration of digital technologies into the education systems of many low-income nations is often not driven primarily by national government policy but entwined with long-established 'international development' efforts on the part of state, market and international actors"[78].
This 'international development' component has in past decades focused on using advanced digital technologies as solutions to development issues including in the area of education and over time it established itself particularly around ICTs which lead to the emergence of something called 'ICT4D' - information and communication technology for development.[79] Projects and efforts under the scope of 'ICT4D' have a distinct connection between applications of digital technologies and economic growth in a European and American way of approaching things.[80] Nevertheless, it may offer appealing opportunities for authorities and communities in low-income countries.

With this in mind, one can understand why there are increasingly more instances in which governments decide to form a connection with big companies whose product and knowledge can be used in a certain aspect of a country's infrastructure. Particularly, when it comes to new technologies, corporations developing products in that sector have enhanced interest in such partnerships, be it as a philanthropy projects or market expansion.[81] The main caveat here is that such companies, even if the truly aspire to bring positive change, always also follow their own agenda. "[T]he role of technology firms in philanthropic work in low-income contexts is clearly a multifaceted area – motivated as much by the longer-term benefits of building stable national participants in the global 'knowledge economy', as they are by the shorter-term benefits of increased sales in 'emerging markets'."[82] Even when working with companies that supply commodities such as devices and expert knowledge on how to use them, the responsible authorities still need to pay attention to good implementation. "For instance, the guiding 'e-schools business plan' [pertaining to the

[78]Neil Selwyn, Education in a Digital World: Global Perspectives on Technology and Education, Taylor & Francis Group, London, 2012, p.106
[79] Selwyn, "Education in a Digital World", p.109
[80] Selwyn, "Education in a Digital World", p.109
[81] Selwyn, "Education in a Digital World", p.113
[82] Selwyn, "Education in a Digital World", p.115

NEPAD 'e-Schools' initiative in Africa[83]] that governments have been encouraged to use as a policy template was developed by the international auditor and accountancy firm Ernst & Young."[84] Considering this, it becomes clear that these activities can have a significant influence not only on how educational technologies are implemented, but also reached farther into the realm of official policy making. This raises the question whether an accounting firm that sees schools as a 'businesses' should have this much impact on potential policies. Moreover, in 2019 an article about a training seminar for female executives at Ernst & Young in the U.S. was published, which gave examples from the presentation in which women were advised, among other things, that "clothing must flatter", they "should look healthy and fit, with a ""good haircut"" and ""manicured nails"", and not "be too aggressive or outspoken"[85]. Of course, this does not mean that the plans from Ernst & Young were not well developed, but it also is not particularly reassuring, considering they may have influence in educational environments in which stereotyping needs to be extinguished. If financial or material support is simply used to give a more 'modern' and 'economic market friendly' aspect to the school system and existing educational structures, then already existing problems remain and might even be exacerbated.

Another actor that may provide support to for advancements in education are aid agencies. Whether they are international organisations, local non-profit organisations, international and local NGOs, or civil society organisations, many of them have great interest in improving the education systems in developing regions. These foreign and national actors can supply financial assistance or material goods and they are also "taking responsibility for channelling the funding that comes into countries from international aid organisations, as well as financing their own initiatives and projects"[86]. An advantage that these smaller projects can have is that they are community based, interact closely with people and therefore meet their real needs, which also means that they can be further developed and enhanced, for example with indigenous knowledge that only the local people have.[87] Moreover, many of the non-

[83]E-Learnin Africa, "The NEPAD e-school initiative" https://ela-newsportal.com/the-nepad-e-schools-initiative/ accessed on 17.July.2021
[84] Selwyn, N. "Education in a Digital World:", p.113

[85] Emiliy Peck, "Women At Ernst & Young Instructed On How To Dress, Act Nicely Around Men", *HuffPost*, 10/21/2019, https://www.huffpost.com/entry/women-ernst-young-how-to-dress-act-around-men_n_5da721eee4b002e33e78606a accesses on 18.07.2021
[86] Selwyn, "Education in a Digital World", p.115
[87] Selwyn, "Education in a Digital World", p.117

profit efforts are more cost efficient as well as sustainable as they often supply developing countries with donated computers which have been recycled and refurbished.[88]

The bottom line is with money comes influence and it is important to know who takes part in shaping the educational landscape. Even though the government can engage in partnerships with the private sector to enhance means of financing, it still holds all the responsibility regarding aspects of educational infrastructure[89]. Additionally, "[i]t has been established that privatization has specific negative consequences for girls and women and particularly girls from poorer families, excluding them from education"[90] which means that even more attention needs to be given to gender sensitive implementation, so that such clear violations of the right to education are eliminated.

4.2.3. Teachers' attitudes and IT skills

A good teacher is one of the fundamental pillars of a good education system. A trained teacher who receives a domestically competitive salary, and can provide teaching materials, is part of the 'availability' factor of the right to education.[91] However, it is challenging to be a good or even a decent teacher when one is not properly trained, most likely has to teach in an overcrowded classroom and might even be missing the necessary materials to perform as well as expected. For that reason, well implemented digital technologies can assist in tackling multiple issues. However, when providing teachers with training on how to use them and integrate them int their teaching methods it is crucial that they are also made aware of the gender disparities within the field and the potential problems it would cause if they were to contribute to those with their own lessons.

When new advancements or changes are introduced to the teaching process the primary concern is how they will affect the students and how they are going to respond to them. However, often the teachers' situation is neglected. This is an issue since the teacher is generally the intermediary between the educational material and the students and is also the one who is in charge of conveying knowledge to the students. Particularly when it comes to new technologies and digital tools, considering the teachers' position and attitude towards these new developments is important, because in many instances the new types of devices

[88] Selwyn, "Education in a Digital World", p.116
[89] Coomans, "Key Elements", p.6
[90] General Recommendation No.36, p.9
[91] General Comment No.13, p.9

provide students new ways of accessing information and independently interacting with materials which can change the role of the teacher from primary source of information to supporter in a more self-directed learning process. Thus, it is recommended to "upgrade teachers' knowledge and competence in the use of Information Communication Technologies […] and provide training in skills required to operate in an open learning environment"[92]. Various kinds of devices which offer differing modes of delivery and methods of teaching also need to be introduced to the teachers and evaluated on their merits and usefulness in given educational contexts. However, ICTs are also an area which young adults and even children are often more familiar with then older generations. Therefore, it is necessary, in the area of new technologies specifically, to make sure teachers understand the potential impact of these opportunities and how they, as instructors, as well as their students as recipients can benefit from them. Lastly, they also need to be aware of the gender bias which is prevalent in the field of computers and digitalisation and how the implementation within the classroom can have far reaching consequences for young girls.

In order to successfully implement digital devices and other forms of new technologies into education it is imperative that not only students, but teachers as well know how to use them and are comfortable engaging with others about it. Studies have shown that teachers' knowledge and behaviour significantly influence the successful outcome of including various forms of digital technology into existing teaching structures. Li et al. found that professional development activities for teachers in the field of promoting ICT integration lead to a positive outcome on six factors namely: "professional competency in educational use of ICT, collaboration for ICT integration, benefits on use of ICT, autonomy to innovate, recognition as a professional, and skills and practices in educational use of ICT"[93].

A very serious aspect of teaching in general, but particularly when it comes to technology, is a gender bias which puts young girls at a disadvantage. Science and technology are currently male dominated fields and therefore more likely to be perceived as something that is appealing to young men. However, the ability to work with digital devices and their various programmes, as well as the knowledge of employing the internet for access to information and communication are highly useful skills for every young student hoping to enter the job

[92] General Recommendation No.36, p.9
[93] Shengru Li, Shinobu Yamaguchi, Javzan Sukhbaatar, Jun-ichi Takada, "The Influence of Teachers' Professional Development Activities on the Factors Promoting ICT Integration in Primary Schools in Mongolia", *Education Sciences* (9/78), 2019, p.14

market at some point. For girls it is especially important that they receive sufficient support, as even seemingly small actions such as making an effort to specifically "introducing girls to technology education and taking an extra effort in encouraging them in their studies"[94] or providing them with suitable female role models from the IT sector have been shown to make a difference in girls feelings towards and success in technological education[95]. Another considerable aspect is that girls feel more motivated to engage with IT education if it relates to "topics that tap into their interests and prior knowledge (NCWIT, 2015b)"[96].

The given studies on the subject were conducted in societies which are considered progressive in terms of equality for men and women and if girls are discouraged from pursuing technology related education due to perceiving "technology as a topic connected to male gender stereotypes and something alien to women and girls"[97] even in those regions, one can only imagine how much more difficult it might be in a culture that struggles with significantly more gender discrimination. Therefore, the implementation of potential new teaching and learning methods which concern digital technology are an opportunity to tackle these problems and aim for a more gender-neutral approach to the subject. While teachers ideally should of course never exhibit gender bias in how they teach their students it is nearly impossible to change some old structures which have been around for too long. Therefore, teachers that are being instructed on how to implement digital technology, should also be made aware of how they can contribute to a more equitable and beneficial education for all their student.

Quality education starts with well-educated teachers. "Promoting professional development ofteachers to achieve quality education has become more relevant than ever worldwide,as emphasized in the Sustainable Development Goal 4. Teachers' professional development is especially important in the context of educational change, such as the introduction of ICT into education".[98] In this regard State parties also need to take action to "eliminate ideological and structural barriers […] particularly at the secondary level, for example, […] teacher attitudes that prevent girls from making free choices in terms of subject choice and course options"[99].

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[94] Virtanen and others, "Gender-bases motivational differences", p.208
[95] Catherine Lang, Julie Fisher, and Helan Forgasz. "Computing, Girls and Education: What we need to know to change how girls think about information technology", Australasian Journal of information System, 2020,. Vol 24, p.5
[96] Lang, Fisher, and Forgasz. "Computing, Girls and Education", p.5
[97] Virtanen and others, "Gender-bases motivational differences", p.11
[98] Li and others, "The Influence of Teachers'", p..13
[99] General Recommendation No. 36, p.14

Whether it is done consciously or due to an unintentional bias boys and girls are often not treated equally by their teachers, which may lead to such outcomes as girls having less opportunity to speak or contribute in class then boys.[100] In order to implement digital aspects of education successfully in a manner that is beneficial to all students equally we need to strengthen not only teachers' computer and ICT skills but also „"the capacity of teachers to provide gender-responsive pedagogy that is free of prejudice and stereotypes and that engages boys and girls equally"[101]. Another step is "to address the shortage of qualified teachers" head on and in addition "promote the recruitment of female teachers", so that young female students may have role models and someone they can identify with.[102]

4.2.3. Students' attitudes and IT skills

Following from the previous section discussing teachers' roles within the introduction of new ways to incorporate the world's increasing digitalisation into the classroom, it is equally important to consider the students' positions. Compared to many of their teachers on the one hand, students of today have grown up during a time where smartphones and laptops are not considered a novelty anymore and there is a chance that they are familiar and comfortable with using them in their daily lives, more so than their teachers. In General Comment No.25 it was even stated that "children reported that the digital environment afforded them crucial opportunities for their voices to be heard in matters that affected them"[103]. On the other hand, the fact that a child grows up during a time when certain things are theoretically widely available does not mean automatic access to those things, particularly if you are a child from a less developed country, a poorer social class, or a girl. When examining students' attitudes, we need to consider both possibilities. The one that they already possess certain skills which could be utilised to enhance their learning experience, and the one that they may know about such things in theory but were not fortunate enough to possess or interact with new digital devices. Lastly, the attention must be directed to girls and young women and the attitudinal challenges they might face based on stereotypes surrounding girls and technology. Their mindset and toward the subject which can be heavily influenced by the attitudes they get convey from their surroundings, influence their ability to engaging with and profit from technology.

[100]Plan International France, "Beijing+25", p.16
[101] Plan International France, "Beijing+25", p.37
[102] Plan International France, "Beijing+25", p. 37
[103] CRC, General Comment No.25, p.3

Considering that younger generations have grown up in the age of digital technology it is possible that they already possess a certain set of skills regarding the use of new digital devices or even own a smartphone or another appliance that enables them to benefit from the advantages this provides. As mentioned in the previous section they might even have more skills and confidence in using these tools than their teachers. This could be utilized as a means to engage students more with the learning materials as it might give them a sense of incorporating something that they consider useful or even fun into the learning process[104].

Moreover, children are generally curious and less timid when interacting with new mediums and exploring the use of devices such as tablets or smartphones without fear of making mistakes. Given the possibility they are capable of discovering and learning many things on their own such as using programmes to practice reading and engaging with others to solve problems[105]. Nevertheless, it is important that what they find and consume while working on their digital devices and potentially using the internet is actually beneficial for their education, which links to importance of learning materials and the involvement of teachers in the process discussed in the other sections.

Despite the fact that digital technologies are becoming a substantial part of many aspects of daily life all over the world, the common stereotype of boys having more affinity towards the subject than girls remains, particularly when it comes to using technology in areas beyond everyday life and in a more professional setting. The global education monitoring report for example showed that even in developed countries "girls internalized the view that they are less suited than boys for science, technology, engineering and mathematics, which discouraged them from pursuing degrees in these fields"[106]. Social and cultural settings in which strong gender stereotypes prevail might be particularly prone to be an environment in which such underlying conceptions exist. Therefore, it is important to realise that girls might feel like they are not the ones that are supposed to show increased interest in a certain topic and shy away from engaging with it further. It has been shown that when given the opportunity and right support, girls and young women show great interest in topics relating to new technologies such as coding and other subjects related to technology such as software

[104] See: Patricia Wastiau, Roger Blamire, Caroline Kearney, Valerie Quittre, Eva Van de Gaer & Christian Monseur . "The Use of ICT in Education: a survey of schools in Europe"; *European Journal of Education*, Part I, Oxford: Blackwell Publishing, 2013
[105] See *60 million girls* Foundation, "Mobile Learning Lab" 2018 p.5f.
[106] UNESCO, "Global Education Monitoring Report 2020", p.21

engineering[107]. This all relates back to the previous section of the teachers' role and should be taken as an impulse to take matter of making sure that girls feel included and confident in relation to the subject of digital technology and all that comes with it.
However, if and how much access individual students have could vary so much from school to school, region to region, and country to country that placing too much of an emphasis on this aspect would be generalising to an unrealistic degree. While it is an element that needs to be considered it is very much tied to the specific situation of any given classroom. The main goal is to support young women and girls, since "the education of girls and women is considered to be one of the most effective investments for sustainable and inclusive development"[108]. A girl that receives quality education is more likely to avoid early marriage and pregnancy, get a job and gain empowerments, as well as part take in decision making processes of her community and public life.[109] Moreover, an increase in educated women with jobs contributes to a country's economic growth and, most importantly, paves the way for future generations of girls to get educated as well.[110]

4.2.4. Content of teaching materials and their presentation

4.2.4.1. Providing Materials

Providing the infrastructure and necessary tools for digital modernisation within classrooms is only the first step. How they will be used and incorporated into the teaching process also plays an important role, which leads to the matter of what kind of learning materials the students will gain access to and how these will be presented to them. Quality education that fosters equitable development for all students cannot be achieved by simply updating to more modern equipment for schools. If the introduction of new digital technologies is meant to change educational situations towards more equality and provide empowerment for girls which "equips them with capacities to claim and exercise broader socio-economic, cultural and political rights, on an equal basis with boys and men in their societies"[111] the content and subject matter they are given have to be recognized for the consequences they have. Gender stereotyping or discrimination can happen at any point in the educational process. It is

[107] UN Women, "If you teach a girl to code, she will change the world", https://www.unwomen.org/en/news/stories/2019/10/feature--kenya-kakuma-refugee-girls-learn-coding accessd on 14.07.2021
[108] General Recommendation No. 36, p.2
[109] Plan International France, "Beijing +25", p.11
[110] Plan International France, "Beijing +25", p.11
[111] General Recommendation No. 36, p.4

therefore important to pay attention to the content that students are being shown as well as which materials they can access by themselves, which underlines the necessity for " the creation and dissemination of diverse digital educational resources of good quality in the languages that children understand and ensure that existing inequalities are not exacerbated, such as those experienced by girls"[112].

An example would be pre-downloaded reading materials such as those that were used in the OLPC or Mobile Learning Lab projects. Who choses them and for what purpose? How much attention is paid to the more subtle content of the chosen materials? Many "classic stories" such as older fairy tales often contain gender stereotypes and the same applies to many children's books in which girls are often more likely to like cooking or shopping as opposed to playing sports for example. This is not to say that stories such as traditional tales and folklore should be disregarded or omitted from being talked about. It merely means that it would be crucial to make an effort to also provide reading materials and stories which show both girls and boys in a variety of ways and experiencing the world in non-gender-stereotyped ways.

As has been previously discussed the attitude of teachers towards using digital devices within their classrooms matter and willingness to include these new tools and materials extends to the aspect of the kind of content that is used as well. This really pertains to most teaching situations, not just those related to digital technologies, but since they present a new, more innovative way of learning they provide an opportunity to consciously choose materials and topics that give all students an equal chance to engage with them and see themselves included in what is being learned and talked about. As recommended by the Committee on the Elimination of Discrimination against Women, what matters is "revising and developing non-stereotypical educational curricula, textbooks and teaching materials to eliminate traditional gender stereotypes that reproduce and reinforce gender-based discrimination […] and to promote more balanced, accurate, healthy, and positive projections of female images and voices"[113].

4.2.4.2 Presentation matters

[112] General Comment No,25, p.17
[113] General Recommendation No. 36, p.7

Considering presentation of materials in schools there are many options available to the person presenting content and educational materials. As mentioned before teachers' motivation and capability to incorporate new digital tools and ICT into their educational programme directly corresponds to students potential learning benefits. A study conducted in the 6th grade of three schools in Kenya showed that the different manners in which new digital technologies are used lead to different outcomes in student performance. The new appliance that was introduced to the classroom was an ICT program using DVD-based content and the aim was to make use of them in such a way that the students have improved learning outcomes in math and science classes [114]. In the first school the examined classes were all "digital" meaning they all included an ICT based programme, in the second school there were two digital classes and one "analog" class without new technologies, while in the third had two analog classes and one digital class[115]. The result was that in school two and three "the test results from science classes showed that the test mean score of the digital class was higher than that for the analog class, which indicates that the introduction of the ICT program using DVD-based content had some impact on the exam results"[116]. However, the second school despite having more digital input classes showed a higher mean value for the analog classes, than the ones in the third school. "Observational analysis conducted using the session recordings revealed that the teachers in the different schools used different methods of integrating ICT into their lessons."[117] The teacher in school three chose an interactive approach to include the DVD-based ICT materials into the class. They presented the material from the DVD in a way that highlighted and underlined important points and additionally, encouraged discussions surrounding the given footage. While the teacher of the second school merely showed the footage without pausing or supplementing it. Therefore, it is important to note that simply providing digital tools or materials does not guarantee improvement of education and the different ways in which the teachers chose to present the materials led to clear difference in outcome.[118]

When teachers have no prior experience using digital programmes they might be under the false impression that simply including ICTs would resolve potential problems they have when teaching. An examination of the ways of teaching between teachers from two different schools in Kenya showed that a teacher even with limited experience in using ICTs in the

[114]Tabira and Otieno, "Integration and Implementation", p.221–234
[115] Tabira and Otieno, "Integration and Implementation", p.221–234
[116] Tabira and Otieno, "Integration and Implementation",p.231
[117] Tabira and Otieno, "Integration and Implementation",p.231
[118] Tabira and Otieno, "Integration and Implementation", p.232

classroom had a clearer understanding of its limitations and used the digital components in a more targeted way, while a teacher that had not used ICT before and implemented them in a way that was ineffective since the digital content was merely replacing him as the mode of delivery.[119]

Including teachers into the preparation and planning stage is another method to increase the success of developing ICT-based teaching materials. The Japan sponsored project 'Strengthening of Mathematics and Science in Secondary Education' which was "aimed at popularizing instruction of math and science in Africa" did not succeed in changing teachers attitudes concerning the objectives of the project and had even after a decade not managed to renew the majority of teachers' interest in teaching[120]. Meanwhile, the project examined by Tabira and Otieno placed emphasis on community and the group of teachers that were not only involved in implementing the new teaching material in the classroom but also in designing and building them, which was considered to be a major positive influence with regard to teachers' motivation as well as will and ability to improve upon the system during the process and later on. "It is […] apparent that ICT projects, especially those in developing countries, need to be community driven to a significant degree."[121]Considering this we can see that the 'how' and 'for what purpose' of implementing digital tools plays a significant role in the outcome and new technologies cannot simply be used as a replacement for standard teaching methods which are currently being practiced. Moreover, the way in which the new material was developed placed a great emphasis on involving the teachers. They made decisions about the content's design and created the presentation based on national curricula for relevant grades.[122] Furthermore, based on some insight from previous studies, the activities also went through "adaptive cycles" so that it may be further developed and changed until it reaches a satisfactory level agreed upon by everyone involved. Emphasis was also placed on "leveraging the power of ICT at the most cost-effective level to ensure the sustained continuity" because "ICT is the infra-structure charged with improving the quality of delivering education, it has to be developed and implemented within the means and structures therein"[123].

[119] Tabira and Otieno, Integration and Implementation, p.323
[120] Tabira and Otieno, Integration and Implementation, p.323
[121] Tabira and Otieno, Integration and Implementation, p.323
[122] Tabira and Otieno, "Integration and Implementation",p.228
[123] Tabira and Otieno, "Integration and Implementation",p.232

This is not a phenomenon restricted to newly implemented and more basic forms of technologies. In a Chinese university course of the Master of Arts in Instructional Design and Technologies, the transition from in-person classes to a blended learning approach with many online recourses and materials for autonomous working was always accompanied by evaluations from actors involved which enabled a continuous transformation and improvement[124] The conversion from one teaching model to the other took many cycles until the current blended learning model was reached. [125] "The blended learning approach refers to using face-to-face tutorial and e-learning activities. E-learning activities include asynchronous online discussions, synchronous online discussions and reflection blog activities" [126] and according to an evaluation survey, conducted at the end of the course, the students had "a positive perspective about the ability of the blended learning course to engage student learning"[127]. This is another argument for providing the necessary education for teachers as well as involve them in the creation process, so that the technological advancements can always be implemented in a manner that allows it to unfold its full benefits and does not simply make it a replacement for already existing activities.

4.2.4.3 The right to health, and sexual education

An additional component which could be provided within the scope of the materials and content which are introduced by digital technologies are sex education as well as more general knowledge about health care. The necessity for such knowledge relevant to general and sexual health is clearly mentioned in the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) as a significant aspect to of the right to education under Article 10(h) "Access to specific educational information to help to ensure the health and well-being of families, including information and advice on family planning"[128]. Furthermore, it is stated in General Recommendation No. 36 that there needs to be "mandatory age-appropriate curricula at all levels of education, on comprehensive sexuality education including sexual and reproductive health and rights, responsible sexual behaviour, prevention of early pregnancies and prevention of sexually transmitted diseases"[129]. Similarly,

[124] Wing Sum Cheung and Khe Foon Hew, "Applying 'First Principals of Instruction' in a Blended Learning Course",p.127-135 In: K.C. Lie and others (Eds), "Technology in Education: Transforming Educational Practices with Technology", Springer Verlag, Berlin Heidelberg,2014, p.127
[125] Cheung and Hew, "First Principals of Instruction",p.134
[126] Cheung and Hew, "First Principals of Instruction",p.128
[127]Cheung and Hew, "First Principals of Instruction 134
[128] Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW)
[129] CEDAW, General Recommendation No. 36, p.16

Coomans also states the matter of "skills relating to one's health, hygiene and personal care" as one of the core elements of basic education.[130]

In the „Beijing +25" text the recommendation for the Action Coalition on ‚Bodily Autonomy and Sexual and Reproductive Health and Rights' clearly states the need for access to "comprehensive sexuality education for all children in and out of school – appropriate teaching materials, health services, training for teachers and school staff, monitoring and evaluation, safe environments and youth engagement – through a community-based approach to […] create common spaces for dialogue".[131] Furthermore, it is asserted that the government has to invest in "sexual and reproductive health and rights and education to end early and forced marriages, sexual violence, early and unintended pregnancy and sexually transmitted infection, and challenge the social norms that perpetuate these practices"[132].
These clearly formulated statements show quite plainly how the subjects of sexual and reproductive health and the corresponding rights are closely linked to education and societal attitude which need to be addressed widely and at different levels. Digital devices on their own cannot achieve remedying such a deep rooted issue. Nevertheless, they can offer one way of providing a wide array of information on the subject, whether it be because there is information given through educational devices or simply access to the internet. Giving students, in particular girls and young women, the opportunity to inform themselves, alone or together with others, about such crucial aspects of their own lives will surely be beneficial for them as individuals, as well as provide the potential to encourage and support such educational matters within their families and communities.
Making a conscious effort to include health and sex education within the new materials that can accompany the introduction or expansion of digital tools and ICT in schools would be hitting to birds with one stone and thus, an important contribution toward the realisation of the right to education in correlation with the right to health and furthermore the change for a more self-determined life could be achieved.

Such access to these materials can be provided either through "pre-provided" materials on given devices or internet access where the girls and young women could familiarise themselves with the subjects privately and without fear of embarrassment.

[130] Coomans, "Key Elements", p.4
[131] Plan International France, "Beijing+25", p.19
[132] Plan International France, "Beijing+25", p.19

Especially, when it comes to the topic of menstruation and pregnancy many misconceptions may occur, moreover, it is often considered that girls may feel more comfortable talking about it only among themselves without male students present, or even entirely individually. With such an approach, new technologies can help girls to access vital information about women's health and sexual health, which may have a big impact on their future as they will be able to make more informed decisions with their own best interests at heart and will not be dependent on others. A successful example of online resources for sex education is the "Love Matters Arabic" platform created by RNW Media[133] which is specifically catered to young people from the Middle East and North Africa and aims to "provide reliable information to answer young people's questions on topics related to the body, relationships and sexuality" as well as "get them interested in sexuality education and provide information that they may not have received at school"[134]. "In 2019 the Love Matters Arabic website received over 7.4 million visitors and the associated social media accounts Facebook, Twitter, YoutTube and Instagram) reached millions of people."[135]

This, in turn, leads to a more encompassing realization of the right to education and furthermore extends into the right to health (and self-determination), not only because it is empowering to be informed and do not depend on others for vital information, but also because early pregnancy or challenges associated with female periods are some of the leading causes for girls leaving school earlier than is good for them.

Moreover, this more subtle 'self-informed' approach may help to circumvent potential stigma surrounding these topics, which otherwise may make it harder to talk about them in class as they may be considered inappropriate in certain contexts. In addition, the teachers could potentially be lacking the appropriate training to provide sufficient information on these subjects and there might be other obstacles such as cultural taboos surrounding male teachers speaking about such matters to female students or similar stigma[136]. While the ultimate goal should be to educate every student male, female, or non-binary on basic aspects of healthcare, and sexual health as well as appropriate sexual behaviour, an important starting point is the education of young women and girls so that they know how to best take care of themselves through "age appropriate, evidence based, scientifically accurate mandatory curricula at all

[133] RNW Media, Love Matters Arabic, https://www.rnw.org/projects/arabic/ accessed on 05.July.2021
[134] Beijing +25, Plan International France, p.26
[135] Beijing +25, Plan International France, p.26
[136] Beijing +25, Plan International France, p.14

level of education covering comprehensive information on sexual and reproductive health and rights"[137]

5. Covid-19 and the need for new policies

5.1. Covid-19

The ongoing Covid-19 pandemic has posed challenges to several human rights issues and the right to education is no exception. The spread of the pandemic and the following restrictions disrupted everyday life and school systems and routines when governments made the decisions to close schools on account of health and safety concerns.

Due to these circumstances various forms of distance learning, from online to radio communication had to be implemented, which showed how digital technologies and ICT can be utilised and be hugely beneficial during such situations as they provide the opportunity for continuing teaching in an efficient manner. Teachers can hold classes via video calls, they can send detailed written instructions for studying, or prepare exercises which they send out to their students.

While distance learning brought on by a world-wide pandemic is not necessarily a common occurrence, other issues such as extreme weather phenomena brought on by climate change are a potential problem, that in the future could also lead to a need for distance learning. Therefore, it is worth to consider the issue. As stated in the OECD report "Lessons for Education from Covid-19": "Only resilient education systems that plan for disruption, and withstand and recover from adverse events, will be able to fulfil the fundamental human right to education, whatever the circumstances, and foster the level of human capital required by successful economies."[138]

Like so many other things the pandemic presents a challenge for quality and equality in education. Teachers were thrust into the position of having to adapt their teaching style to suit an online teaching environment and while some of them were quite adept at using their computer programmes to make the best of the situation, others, often from older generations, had more difficulty adjusting [source to be added]. In addition, students of different ages have varying levels of concentration, might be more or less hard to engage as well as motivate.

[137] General Recommendation No. 36, p.16

[138] OECD, "LESSONS FOR EDUCATION FROM COVID-19", 2020, p.21, https://doi.org/10.1787/0a530888-en

Moreover, while the majority of children in more developed countries own some form of digital device with which to use ICT programmes, following a class on the small screen of a smartphone as opposed to a laptop or tablet, is not the same experience. As the mother of Armenian child, whose hearing-impaired son attended many of his 7th grade classes on his smart phone via zoom during the pandemic, explained: "It is very hard for him to see sign language via phone… Imagine watching it on the phone…and imagine also the phone screen divided into seven."[139] In other less developed or low-income regions, the potential absence of necessary devices or sudden dependence on online learning, which requires a certain infrastructure and connectivity to the internet, created an additional burden, for even if schools tried to hold classes on Zoom, unstable internet connections or overloads of the system may still prevent it from happening[140]. This "exacerbated learning inequalities because many governments did not have the policies, resources, or infrastructure to roll out online learning in a fully inclusive manner"[141].

Moreover, such situation hit particularly hard for those who already struggle due to belonging to marginalized groups, like women in lower social classes. "A mother in Lagos, Nigeria, who lost her income after the university where she cleaned shut down due to the pandemic, said she could not afford online studies for two of her children" because even though her kids teacher was providing the online classes she could not afford the device or the internet connection.[142] Similarly, a father from Mumbai, India explained that while they could afford one computer he and his wife needed it to be able to work from home and in addition, both of his children had classes at the same time, so even if he could afford to free up the computer for a while, he still would need a second one so that both kids could attend their classes[143].

In situations in which young women and girls are already at a disadvantage and had to deal with multiple forms of discrimination in terms of schooling and access to technology, the pandemic poses an even greater risk to their education. Particularly, since they are less likely to return once their education has been interrupted for a longer period of time. "Girls were far more likely to be expected to take on greater housework burden, were less likely to have access to the internet than boys, and due to societal or familial restraints sometimes faced

[139] Human Rights Watch, Report Summary of "Years Don't Wait for Them": Increased Inequalities in Children's Right to Education Due to the Covid-19 Pandemic (17 May 2021) https://www.hrw.org/report/2021/05/17/years-dont-wait-them/increased-inequalities-childrens-right-education-due-covid accessed on 23.July.2021

[140] Human Rights Watch, "Years Don't Wait For Them"

[141] Human Rights Watch, "Years Don't Wait For Them"

[142] Human Rights Watch, "Years Don't Wait For Them"

[143] Human Rights Watch, "Years Don't Wait For Them"

greater constraints on their interactions with others."[144] The difficulties may however still increase since girls who are unable to attend school are vulnerable to abuse or being pushed into child marriage or other forms of gender based violence. Unfortunately, safety can also be an issue when leaving home. "Taisha S., a 16-year-old student in Garissa, Kenya, said that when her school offered no guidance on how to study during school closures, she tried to get in touch with one teacher who said that he "would not be able to go to anyone's home, but they could come to his house. As girls we feared going to his house, but I hear the boys have been going"".[145] Like many other girl Taisha was additionally prevented from attending classes, which were broadcast on television, due to familial obligation and having to take care of her two grandmothers. It becomes clear that better infrastructure and changed attitudes towards the matter of girls in education could significantly influence such situations and are an important step in upholding their right to education.

In how far the learning outcomes might also have been affected based on gender in high-income regions and whether male and female students showed differences in dealing with the situation remains to be seen. Data on this issue is not yet available. Overall, the abrupt switch to distance learning showed that there are many factors to be considered which can impact the quality of learning and create new injustices on the basis of teachers' skills, personal circumstance, and potentially even gender. "Governments need hastily to get back on track with the commitments they made in 2015 through the United Nations Sustainable Development Goals to guarantee all children receive an inclusive quality primary and secondary education by 2030."[146] It is now extremely important that authorities place particular emphasis on supporting those students which suffered most during the pandemic and are also those at highest risk of not returning, many of which are girls who are live in rural arears, are affected by poverty, have fallen pregnant and/or gotten married during this time, or simply had to start working to support their families.

Even though the Covid-19 pandemic presented a great challenge and shown a light on problems within the education systems of most countries, it also started a conversation around the topic of the use of ICT and digital tools in schools. It provided a push to move forward in this regard, because now that the problems have been indicated it will make us think about possible solutions and improvements going forward. Actors and stakeholders "agreed that the

[144] Human Rights Watch, "Years Don't Wait For Them"
[145] Human Rights Watch, "Years Don't Wait For Them"
[146] Human Rights Watch Report Summary of "Years Don't Wait for Them": Increased Inequalities in Children's Right to Education Due to the Covid-19 Pandemic (17 May 2021) https://www.hrw.org/report/2021/05/17/years-dont-wait-them/increased-inequalities-childrens-right-education-due-covid accessed on 23.July.2021

COVID-19 crisis had accelerated both thinking and action in education, substantially shifting attitudes within education systems in key areas of longer-term change- such as digitalisation and assessment- where there had previously been a certain level of resistance"[147].

Furthermore, it is also a gave rise to discussions about new policies or potential changes in existing ones, because simply returning to the educational patterns of the pre-Covid-19 area is no longer an option[148]. The OECD report states that these "unprecedented challenges facing this generation and global society in general demand that education systems maintain the momentum of collective emergency action to leap forward into a better normal."[149] The recently implemented more flexible approaches to teaching and learning should be considered as more than just a response to this emergency situation and could provide the stepping stone for rethinking and restructuring the system.[150]
This provides an opportunity for "policy makers [who] must now act smartly, identifying the levers of change where quick wins today can translate into greater wins tomorrow"[151], which will be examined in the following section.

5.2. Policies regarding the use of technology

Policies concerning educational systems and school vary widely among countries. Nevertheless, some basic focal points which could be useful or even necessary to draft policies regarding the use of digital technologies and ICT in education. They need to cover a well-established learning environment, digitalisation as an emerging but lasting and necessary component of education, and gender sensitivity at every level. General Comment No, 36 clearly establishes that "to achieve gender equality all aspects of the education system – laws and policies, educational content, pedagogies and learning environments - should be gender sensitive, responsive to the needs of girls and women and transformative for both females and males". [152]

Comparing and analysing specific policies especially for states which may not have particularly well-established public records or official reference mechanisms, as well as vary

[147] OECD, "LESSONS FOR EDUCATION FROM COVID-19", p.22
[148] OECD, "LESSONS FOR EDUCATION FROM COVID-19, p.14
[149] OECD, "LESSONS FOR EDUCATION FROM COVID-19, p.14
[150] OECD, "LESSONS FOR EDUCATION FROM COVID-19, p.29
[151] OECD, "LESSONS FOR EDUCATION FROM COVID-19, p.1
[152]General Recommendation No.36, p.4

widely in availability of different languages, is a wide research task within itself. However, some insight can be drawn from OECD report on Education Policy Outlook in which the most often observed direction for policy developments concerning school improvements up to 2019 were among others: "improving education systems' learning environments (through general strategies for schools, policies aimed at improving learning conditions to support all students, and policies on digitalisation of schools)"[153]. Continuously it also establishes:

"Policy efforts related to digitalisation refer to access, processes and capacities. Some education systems reported having implemented recent and continued policies to provide Internet access to schools […]or the digitalisation of student plans […]. Education systems have also been working to help build digital capacity, according to evidence collected for Canada […], France and Spain. France, Greece and Spain have focused on improving technical resources and skills, such as by providing tablets, updating education plans with courses on programming, setting up online platforms, or providing professional development opportunities to teachers. But technological capacity can also relate to the strengthening of emotional skills to improve the responsible use of digital devices."[154]

A lesson that can be learned from the Covid-19 crisis is that while digital technologies have been incorporated more and more into the school setting, once they had to be used widely and by everyone regardless of their personal stance toward it, the outcomes were very varied and kids' learning became inconsistent . A uniform approach concerning at least the most basic aspects of educational use of new technologies is needed to avoid such huge discrepancies moving forward. Moreover, as examined in a paper by Marshall et al., patriarchal structures in the field of education especially at higher levels are still prominent and prevent important development from taking place.[155] "Women's voices, priorities, competencies, and values are tremendously useful to expanding more inclusive, family-oriented, nurturing, and collaborative schooling practices" [156]. Therefore, the lack of female representation in higher positions in the field of education is harmful.

Actors responsible for drafting policies regarding education should also be aware of gender sensitive issues and make sure that young women and girls do not suffer from indirect and

[153] OECD, *Education Policy Outlook 2019: Working Together to Help Students Achieve their Potential*, OECD Publishing, Paris, (2019), p. 2 https://doi-org.ezproxy.its.uu.se/10.1787/2b8ad56e-en.) accessed on: 18.July.2021

[154] OECD, *Education Policy Outlook 2019,* p. 66 https://doi-org.ezproxy.its.uu.se/10.1787/2b8ad56e-en

[155] See: Catherine Marshall, Mark Johnson, and Torrie Edwards, "A Feminist Critical Policy Analysis of Patriarchy in Leadership"; In: Michelle D. Young Sarah Diem (Eds.), *Critical Approaches to Education Policy Analysis: Moving Beyond Tradition*, 2017

[156] Marshall and others, "A Feminist Critical Policy Analysis", p.147

hidden or even overt gender discrimination, so that they may enjoy their right to education to the fullest.

6. Potential dangers

While the majority of this text highlights all the benefits we stand to gain from the proper implementation and use of ICT and digital devices in schools and education systems, it cannot be denied that there are also dangers accompanying it. These need to be addressed from the start, so as to make people aware of them and how to take steps against them.

One issue is the potential tendency to simply replace mediocre or even subpar existing ways of teaching with an action that involves a digital device. Letting students take notes from a power point presentation on a screen instead of from something written on the blackboard is hardly an educational advancement. "Understanding the role of digital technology in 'developmental' terms […] involves more than celebrating the use of technology as a neutral tool to address the problems of low-income countries. This is an important distinction to make, as the notion of the 'technical fix' has long pervaded the field of international development"[157]. Therefore, it is necessary that the implementation of new technologies and ICTs in low-income or developing countries is still subjected to critical analysis and is not being treated more leniently in an "anything is better than nothing" approach, as ineffective application of new methods in educational settings is not beneficial.[158] "In particular, the false promise of potential transformation on behalf of an incoming technology runs the risk of distracting attention away from the wider, deeper and more fundamental issues that underpin the provision of education in developing countries and contexts."[159]

Moreover, there are other rather serious issues, particularly concerning the use of the internet and cybercrime. Giving children access to the internet is like giving them access to an entire new dimension of information and opportunity. Particularly, if they belong to social groups with limited access to public life, because of social, economic, or personal reasons. Especially when it comes to "building knowledge, expressing ideas and mobilizing social and political change" it can be "considered an important vehicle for democracy"[160].

[157] Selwyn, "Education in a Digital World, Global Perspectives", p.197-198
[158] Selwyn, "Education in a Digital World, Global Perspectives", p.124
[159] Selwyn, "Education in a Digital World, Global Perspectives", p.125
[160] Maria Sjöhol, *Seminar Women's Rights*, 16 February 2021, University of Uppsala

However, with that comes the danger of consuming age inappropriate content, false information posing as legitimate, and the vulnerability to become a victim of online falsehoods, or even online violence. Particularly, women and girls often suffer from being harassed online. Personal attacks on social media against public and private female figures are shockingly commonplace and also general sexism and even real misogyny is not uncommon. "Empirical studies indicate that women to a higher degree than men are subjected to a variety of gender-based offences online, with such consequences as physical and psychological harm, retreatment from the Internet and a loss of financial and educational opportunities. Particularly women who contravene gender stereotypical norms of behavior or are in influential positions."[161]
A rather serious problem which also affects teenagers most often and is often linked to school is cyberbullying, an issue which is even addressed in General Recommendation No. 36 where it is stated that girls experiences „cyberbullying carried out through the use of technology and various social media to intimidate, threaten, or harass them" and „that girls are almost twice as likely as boys to be both victims and perpetrators". General Comment No36, p.16

Additionally, the Committee recommends that State parties undertake measure in schools, such as developing comprehensive programmes that inform teachers, students and parents about cyberbullying, putting policies in place to ensure technology is not used for bullying and establish channels to report misconduct.[162]

The inclusion of digital devices in everyday school activities can be problematic in an environment where not everyone is able to afford similar equipment. While the overall effect on the learning and working process in schools might be positive when new digital advancements are introduced, some students might be at a disadvantage due to lack of financial resource. A possible solution to this would be that those students could get financial support or have devices provided to them by the school, however, that might be considered unfair to those who are also struggling financially but managed to still acquire some sort of device. Contrary to that and to ensure higher level of equality the school system could provide the same devices for all students, however, that would be a significant financial expense,

[161] Maria Sjöholm, *Seminar Women's Rights*
[162] General Comment No.36, p17

which is unlikely to be feasible for any developing country. Achieving educational goals while circumventing all potential aspects for inequality can present quite the challenge.

An additional complication in this regard is the fact that the internet and all that accompanies it has been changing and expanding so fast since it first appeared that there are many legal question marks surrounding it. Especially when it comes to people's behaviour online, the issue of what is allowed and who has the responsibility to take action in case of misconduct is often unclear. When it comes to free speech online, privately owned online providers, social media websites, the privacy of personal data, or even online pornography, those are only some aspects that do not have clear legal regulations and are currently attracting academic and legal interest.[163] If a woman in Sweden is being harassed by a German citizen living in Austria on a privately-owned social media site the question of who can or is obliged to take which action, can by convoluted. Social media, especially the field of influencers is also a matter that poses dangers for teenagers, particularly young girls. Many young men and women these days make actual careers out of having an online presence. Young, inexperienced children and teenagers consuming such content can be drawn into this space not realising what is authentic and real and what is just 'self-promoting' and posing for views and likes [source to be added]. Moreover, the intensive use of 'filters' on images and videos used by influencers to make themselves appear more attractive, has led to an increase in young people striving to keep up with these unattainable beauty standards, even going so far as to prompt an increase in plastic surgeries 'source to be added].

As already mentioned, the protection of personal data is also a significant issue. However, it has come into focus even more, in light of the Covid-19 pandemic when the fast transition into online education had to be made and considering data privacy may not have been a priority. According to Jung Han "Children's education data are far less protected than health data"[164]. While the protection of personal data concerning health is under some form of regulation in many countries, even during states of emergencies, data pertaining to children's data at school, which can also be highly personal and sensitive, as it contains names, home addresses, potentially even information on personal behaviors, than can be exploited there are

[163] Smith, International Human Rights Law, p.378
[164] Hye Jung Han. "As Schools Close Over Coronavirus, Protect Kids' Privacy in Online Learning: Education Products Adopted Now May Long Outlive Today's Crisis," https://www.hrw.org/news/2020/03/27/schools-close-over-coronavirus-protect-kids-privacy-online-learning, access on 14.July.2021

few countries with laws for the protection of data privacy especially when it comes to children[165]. This means that if there should be a breach of access to private information of schools "governments will struggle to hold EdTech providers accountable for how they handle children's data"[166].

While these are serious far reaching legal issues, some of the others dange4rs such as malware or cyberbullying can be address with parents, teachers and children directly. Once made aware of these issues there are resources for how to protect children and also how they can protect themselves such as those provided on GFC Global instructions on internet safety.[167] Which is at least one step in the direction of responsible and meaningful use of digital technologies.

Other downsides of digitalisation which are not primarily linked to its application in education but are becoming more and more evident, particularly in digitally very developed, high-income countries were the use of smartphones, computers, and tablets is ubiquitous have started to emerge. Smartphone or social media addiction, problems sleeping, and even increases in stress, anxiety and depression have been linked to social media use by various studies.[168] Consistent consumption of online media and the constant stream of new information or receiving copious amounts of messages can also affect people's ability to focus and concentrate on one thing for a longer period of time. "Continuous partial attention […] a phrase coined by the ex-Apple and Microsoft consultant Linda Stone" refers to what happens when people assume "an always-on, anywhere, anytime, any place behaviour" and consequently start "exist in a constant state of alertness that scans the world but never really gives our full attention to anything".[169] It can also lead to challenges in the work place as "new technologies require the employees who are working with them to possess specific competencies in the field of using computerised equipment and general

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[165] Han, "As Schools Close Over Coronavirus"

[166]Han "Schools Closde Over Coronavirus"

[167] GFC webslite, Global Instructions on Internet Safety https://edu.gcfglobal.org/en/internetsafetyforkids/teaching-kids-about-internet-safety/1/ accessed on 28.August.2021

[168]See: Pavica Sheldon, Philipp A. Rauschnabel, James M. Honeycutt, "Social Media and Mental and Physical Health", In: Pavica Sheldon, Philipp A. Rauschnabel, James M. Honeycutt (Eds.) „The Dark Side of Social Media",Academic Press, 2019,Pages 3-21 https://doi.org/10.1016/B978-0-12-815917-0.00001-0

169 Harriet Griffey, "The lost art of concentration: being distracted in a digital world", The Guardian, 14. October. 2018 https://www.theguardian.com/lifeandstyle/2018/oct/14/the-lost-art-of-concentration-being-distracted-in-a-digital-world accessed on 15.July.2021

dealings with these new technologies [translated]"[170]. It has been considered that the high extent of task variety in combination the increase of multitasking in connected to the development of relevant factors such as intensifying and concentration of the work load, interruptions of activities and phases of concentration, interruption of necessary periods of rest, as well as constant control of work activities due to digitalisation, have the tendency to be overwhelming for employees on an emotional as well as a cognitive level, which leads to potential problems for effectiveness and stress reduction.[171]

Another issue of digitalisation is the race and gender bias that can occur with new programmes and devices depending on how much thought and care was put into their development. A very telling video titled "AI, Ain't I A Woman?" by Joy Buolamwini a computer scientist at the Massachusetts Institute of Technology depicts in a haunting fashion how artificial intelligence programmes fail to recognise the faces of black women.[172] Similarly, for persons from Asian descent facial recognition programmes have repeatedly been reported to claim that someone's eyes were closed even thought they were not.[173] The reason for these failures of the programmes are most likely to lie in the way the algorithms for the programmes are set up. Put simply: if whoever is designing the algorithm does not provide it the right kind of diverse images and information, it will fail to recognise the features it was not programmed to identify.[174]

While this is most likely an unintentional oversight without malice of thought, it still matters. Additionally, even features of technological devices which are much more practical show problems with bias. Smartphones are often designed in a way which is more difficult to use for people with smaller hands, who, on average, are women. A telling realisation about the industry and yet another reason to encourage more diverse female participation

170 Wolfgang Schneider. "Psychosoziale Folgen der Digitalisierung". Psychotherapeut 63, 291–300 (2018). https://doi-org.ezproxy.its.uu.se/10.1007/s00278-017-0186-8

[171] Schneider, "Pyschosoziale Folgen"
[172]Joy Buolamwini, "AI, Ain't I A Woman?", YouTube https://www.youtube.com/watch?v=QxuyfWoVV98 accessed on 13.July.2021
[173] See: "Are Face-Detection Cameras Racist", Adam Rose, Time, 2010: http://content.time.com/time/business/article/0,8599,1954643,00.html; and "New Zealand passport robot tells applicant of Asian descent to open eyes", Reuters,2016 https://www.reuters.com/article/us-newzealand-passport-error-idUSKBN13W0RL
[174] Joy Buolamwini „How I'm fighting bias in algorithms", YouTube, https://www.youtube.com/watch?v=UG_X_7g63rY accessed 11.July.2021

7. Conclusion

In conclusion it can be said that digitalisation is on the rise and taking over many aspects of people's daily lives at incredible speed. Digital technologies will be a significant part of the future for better or for worse. When it comes to education, studies from countries in which digital devices and the daily use of the internet are extremely common have shown that there are indeed many beneficial aspects to including digital devices and information and communication technology in the teaching process. If the education system, which for a long time consisted solely of a group of students, their teachers, and their textbooks, can be expanded to include more ways of learning, that is undoubtably a positive change. Giving students the opportunity to receive new knowledge in new ways, be it through readings, audio, video, or interactive presentations and games, means providing more options which can cater to individual students and the learning styles which benefit them most. Moreover, easy connection to the internet enables today's students access to an incredible amount of information, available to them at any given time, which is unparalleled by anything students from prior generations could work with. The fact that it also fosters more self-directed learning and collaborating with others, is an additional benefit. Moreover, computer skill and the capabilities to work with or in the digital sphere is inevitable in many parts of the world.

However, students in other parts of the world struggle to even be able to enjoy their right to education and while the ongoing process of realising basic education for all children is difficult one to begin with, the question of what basic education entails is one that also may need to be reexamined in light of current developments. It is conceivable that in the future access to the internet and the digital sphere will be so important within all societies that the right to education will have to include many aspects pertaining to the use of technologies.

The more prevalent issue, however, that seems to emerge when considering the right to education is the continuing problem of inequality between female and male children. Girls who can experience discrimination based on their gender from a very young age are particularly vulnerable to having their right to education denied. Particularly, in societies where harmful gender stereotypes prevail, supporting girls must be a high priority especially, when it comes to new technologies. As has been establishes, as of right now the field of computers and other digital technologies is still considered a 'man's world'.

Therefore, it is vital that when we strive to integrate new digital technologies into the education system it is done with care and consideration for potential hidden risks to female students. It begins with infrastructure and availability of devices. Having the opportunity to study using a tablet or computer could be a massive benefit for girls, who for various reasons are unable to attend school physically at one time or another. However, that also requires accessible materials, whether through an internet connection or pre-provided elements and a teacher who is willing to incorporate this type of learning into his work. Projects that aim to introduce digital devices in schools of developing countries are around, but providing the tools is only the beginning.

Teachers are the next step in the process. They need to be willing and capable to work with the new digital devices and materials, otherwise the benefits are not nearly as good as they could be. The aim should not be to replace the teachers existing tasks with new technologies, but rather to supplement them and make them more appealing and educational. Moreover, in addition to training concerning the use of technologies it is equally important to address issues of gender bias connected to the topic. If girls are to profit from the use of digital technologies they need a teacher who encourages and supports them and realises that girls might need additional attention, if they grew up in an environment that may have conveyed certain gender roles to them. Girls, even in high income countries and societies where they are given ample education opportunities, often seem to internalise the idea that computer ‘are for boys’ and that girls are noted suited for fields such as technology or the hard sciences. Nevertheless, when they are encouraged to pursue them anyway the results are very promising and programmes that target training in those areas, specifically for girls, provide great opportunities and a step in the right direction. Another important element are role models. Actively providing information about women in science to show young girls that it is a field which is open to them and connecting it to subjects they may already be familiar with or interested in are also beneficial.

Therefore, it also transpires that the material that are provided to the students must be kept in mind. Literature is good example with which to illustrate this matter. Providing children with access to e-books through their smartphones or computers is great. However, the content of these books is just as important as the access to them. When educational authorities pre-select the books which will be available to their students as was done in the One Laptop Per Child programme, these selected books need to gender sensitive content. Providing students with books that predominantly depict girls as princesses and boys as pirates or contain other forms

of gender stereotyping is not helpful. The content needs to be varied, inclusive, and educational for girls to profit from it to the fullest.
A special section of materials, which could potentially be made more accessible through digital technologies and the internet is the subject of health and sex education. As the right to education is one that is the building block for the enjoyment of many other rights this is a particularly important aspect. Girls especially, need to have access to information about their sexual and reproductive health, since it influences their life from a very young age and providing digital and online materials that they can access themselves without stigma or dependence on a third party to teach them, presents a chance at personal liberation and independence. It is particularly encouraging to see that some such initiatives have already been launched and seem to be well received.

Nevertheless, there are of course also many potential problems and even dangers concerning the use of digital devices and while some people still struggle to gain stable access to the internet others are suffering serious mental health issues due to an overuse and constant presence of the social media and digital multitasking. Additionally, we are also encountering problems with online security particularly when it comes to personal data and cybercrime. Particularly online harassment seems to be affecting women more so then men, but since it is almost impossible to escape the advancement of digitalisation, the best course of action is to work on solutions and make sure to learn from past occurrences. This is especially true for the current circumstances. The Covid-19 pandemic which sent entire countries into complete lockdowns and forced millions of students and teachers into an unprecedented state of distance learning, has shown people the strong suits but also the weaknesses of the system. Going forward it will become more and more important to invest in resilient education systems, whether in person or online.

The final conclusion that can be drawn with regard to the subject of this text is twofold. Girls' education could definitely benefit from the implementation of new digital technologies as they provide new ways of learning which could be utilised to address some long standing problems concerning young women and girls. However, this is only possible if they are implemented correctly. Gender-sensitivity at every level is the main component of in building educational systems which fight inequality and prepare their students for a fast evolving ever changing world.

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