Children and young people's narratives and perceptions of ICT in education in selected European countries complemented by perspectives of teachers and further relevant stakeholders in the educational context

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DigiGen

Eickelmann, B., Casamassima, G., Labusch, A., Drossel, K., Sisask, M., Teidla-Kunitsõn, G., Kazani, A., Parsanoglou, D., Symeonaki, M., Gudmundsdottir, G.B., Holmarsdottir, H.B., Mifsud, L. & Barbovschi, M.

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Abstract: In this report the main findings of work package 5 'ICT in education' in the five countries Estonia, Germany, Greece, Norway, and Romania are presented, exploring how children and young people regard their education in terms of preparing them for future life in the digital age. The findings are not only reported on the perspectives of children and young people but are also enriched by results from interviews with teachers and national stakeholders. This report is thus intended to provide broad insights

Revision history

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Acknowledgements

Table of contents

Executive summary

Introduction

Due to the progressive digitalisation of all areas of life, the world is subject to change. This particularly affects children and young people as future participants of society, and also affects the education sector as an important institution of learning and teaching in order to prepare younger generations for active participation in society. In this context, with regard to future developments in education and society in Europe, the question arises:

How do children and young people regard their education in terms of preparing them for their future life in the digital age?

The research project, on the impact of technological transformations on the digital generation (DigiGen), with Halla B. Holmarsdottir (OsloMet University) coordinating the scientific leadership, addresses this issue with a dedicated work package (no. 5) regarding 'Information and communication technologies (ICT) in education.' Its intention is to develop an understanding of how children and young people view their teachers' and school's capacity and readiness to support them in preparing for their future in a digital age. This work package – led by Birgit Eickelmann (Paderborn University) and co-leader, Monica Barbovschi (Babes-Bolyai University) – focuses on education as one part of children and young people's everyday lives. It is interlinked with further work packages (digigen.eu) within the more holistic DigiGen project, focusing on the overarching research question, "How are children and young people affected by technological change in their everyday lives?"

Six objectives are pursued within the work package, under the umbrella of the aforementioned overarching question:

(1) To assess how ICT is used in different settings before and after transition into a new formal educational phase, and to establish which children and young people of which socioeconomic characteristics and cultural backgrounds profit, as well as which settings have the potential to support children and young people who are at risk.

(2) To comprehend how children and young people at different ages rate and assess the value of their education as preparation for their future lives, and for developing their own way of living and working in the digital age; moreover, to examine whether there are differences in the way that children and young people from different backgrounds assess their education and the extent to which the latter influences their perspectives.

(3) To identify what children and young people in different transition phases consider as to be threats (risks) in terms of their own ICT use, and how the schools can address these threats, what they consider to be ICT's main potential use in different transition phases, and how their school contributes.

(4) To give children and young people the opportunity to evaluate their teachers' and schools' views and their capacity and readiness to support the younger generation in preparing adequately for the digital age.

(5) To understand the long-term effects of the availability of digital media, specifically including the Internet, on cognitive skills by exploiting administrative data.

(6) To interrogate how other school actors, e.g. relevant stakeholders, evaluate and rate school education and its capacity to prepare children and young people for the digital age at relevant phases and transitions of their lives; and the extent to which the relevant actors take into account differences in children and young people's backgrounds and characteristics.

Key theories and conceptual framework

The results of the DigiGen research on ICT in education are considered against the background of the current state of research. Reference is made to the scoping review – as an essential part of the DigiGen project, which summarises existing empirical findings that address its overarching research on conditions that contribute to children and young people being either negatively or positively impacted by ICT use – in work package 5 particularly focusing on the domain of education. Further, results are considered in the context of theoretical, conceptual and policy-related frameworks that help identify thematic areas. The results are then related specifically to policy frameworks, with a view to advance the understanding of the ongoing digital transformation of society towards improving educational ICT policies and contributing to the same.

The key theoretical, conceptual and policy-related frameworks drawn upon in this research are as follows:

> The European Digital Competence Framework 2.1 for citizens (Carretero Gomez et al., 2017) to identify which **digital skills and competences** are needed at the European level so that children and young people are prepared for their future life in the digital age through education.

> The contextual framework of the International Computer and Information Literacy Study 2018 (ICILS 2018) (Fraillon et al., 2019) to determine which **antecedents and processes in the context of ICT** are crucial at the school and classroom level.

> The framework on the European Digital Rights and Principles and the framework on the UN Sustainable Development Goals (SDGs) to elicit **what challenges and problems are encountered in school-based digital skills acquisition**, and how to deal with them to ensure that children and young people are adequately prepared for their future lives in the digital age.

Current state of research and research questions

The digital generation – children and young people who are born into a digital age and grow up surrounded by digital technology – cannot be assumed to inherently have the digital skills required for active participation in society, nor can it be assumed that all of them would inherently develop the same skills (European Commission, 2019, 2020). Furthermore, the use of ICT can also be challenging in different contexts (Falck et al., 2018). Research across Europe has revealed inequalities between children and young people with regard to ICT in education, and they are closely related to background characteristics, including age, gender, disability, socioeconomic background and ethnic minority background (Barbovschi et al., 2022; Kapella et al., 2022). In particular, this interaction was highlighted with the outbreak of the COVID-19 pandemic and its impact on education, as existing social and digital inequalities in educational systems were accelerated with the pandemic's impact (Eickelmann et al., 2021; European Commission, 2020b).

As summarised in the DigiGen scoping review on the domain of education, previous studies set the ground for DigiGen's research. With regard to the relationship between children and young people's digital competences and their age, it is apparent that there is a lack of research on the younger age group (e.g. Aesart et al., 2015; Wollscheid et al., 2016). Regarding gender differences in digital competences and ICT use, it appears that, while girls score better, on average, in computer and information literacy, boys enjoy ICT use more than girls (Aydin, 2021; Eickelmann et al., 2019; Fraillon et al., 2020). In addition, there are hardly any (representative) studies on the relationship between disabilities and digital competences of children and young people. Research revealed a close link between the socioeconomic background of children and young people and their computer and information literacy (Eickelmann et al., 2019; Fraillon et al., 2020). Likewise, children and young people's ethnic minority background affects the use of ICT in education (Fraillon et al., 2020; Heemskerk et al., 2012, Pagán et al. 2018).

When it comes to the question of what digital skills children and young people have, there are considerable differences within and between various educational systems (Eickelmann et al.,

2019; Fraillon et al., 2020). The consideration of antecedents and processes in the context of ICT in education reveals major differences between and within European countries in terms of the (1) ICT curriculum, (2) ICT resources, (3) ICT use and (4) digital literacy instruction. While there are frameworks for digital rights, principles and development goals to enable children and young people to prepare for their future lives in the digital age, comprehensive results are not yet available. However, these studies did not, or hardly, include the children and young people's perspectives nor data from qualitative in-depth investigations.

To answer the overall question on **how children and young people regard their education in terms of preparing them for future life in the digital age**, a set of eight sub-questions is used in the DigiGen research on ICT in education, covering different areas:

1. How is ICT used in different settings before and after transition into a new formal educational phase, and which children and young people, taking into account socioeconomic characteristics and cultural backgrounds, profit from which kind of setting?

2. How do children and young people at different ages rate and assess the value of their education in terms of preparing them for future life in the digital age, and are there any differences in the way that children and young people from different backgrounds assess their education and the extent to which the latter influences their perspectives?

3. What do children and young people in different transition phases consider as threats (risks) in terms of their own ICT use, and how can schools address these?

4. What do children and young people consider the main potential of ICT use in different transition phases, and do their schools contribute to this?

5. How do children and young people evaluate their teachers' and schools' views and their capacity and readiness to support the younger generation in preparing them adequately for the digital age?

6. What are the long-term effects of the availability of digital media, specifically including the Internet, on cognitive skills?

7. How do other school actors, e.g. relevant stakeholders, evaluate and rate school education and its capacity to prepare young people for the digital age at relevant phases and transitions?

8. To what extent do the relevant actors take into account differences in children and young people's backgrounds and characteristics?

Key to answering these educational related sub-research questions, and thus, the overall research question, is the overall collaborative research design of DigiGen, which involves children and young people as co-researchers, co-creators and co-designers in the digital transformation. Further information on the research design as well as on the objectives' relation to the sub-research questions is provided in **Section 4.2**.

Methodology

In order to answer the overarching research question and the eight sub-research questions, data of the research on ICT in education within the scope of the project on the impact of technological transformations on the digital generation (DigiGen) serves as a basis. The DigiGen research on the domain of education includes five European countries, where empirical data on ICT in education is collected: Estonia, Germany, Greece, Norway and Romania (see Grant Agreement). The research design in work package 5 has three parts:

1) An **add-on pilot study** on COVID-19 in the context of ICT in education, where interviews have been conducted with 26 children and young people from Estonia, Germany, Greece, Norway and Romania who were attending a class right after the transition to a new educational phase. In addition, in total four group discussions were held

with national stakeholders in Germany and Romania on the topic of ICT in education, considering the impact of the COVID-19 pandemic. The data collection was carried out in autumn and winter 2020/2021 (Eickelmann et al., 2020).

2) A **video workshop** (task 5.2), following the DigiGen project's overarching collaborative approach, in which children and young people were engaged as co-researchers designing instruments and collecting data themselves. Video workshops were facilitated by researchers in Estonia, Germany, Greece, Norway and Romania. The workshops involved children and young people attending a class right before the transition and ones attending a class right after the transition to secondary level, as well as teacher candidates whose training focuses either on the pre-transition level or on the post-transition level at secondary level.[1] Interview guidelines were developed by participants who also conducted and video recorded interviews. In total, 12 interview guidelines were developed and 37 videos were recorded. Data collection took place in the autumn/winter of 2021 (Casamassima et al., 2022).

3) A **(qualitative) interview study** (task 5.1), building the core of work package 5 research on ICT in education, to which this deliverable is dedicated. Interviews were conducted with three target groups in all five participating countries: children and young people transitioning into a new formal educational phase (lower secondary education), teachers teaching classes right before transition and teachers teaching classes right after transition into secondary level, as well as national stakeholders relevant to the domain of education. In total, interviews were conducted with 43 children and young people at two measurement points (before and after transition), 18 teachers teaching right before transition, 19 teachers teaching right after transition, and 14 national stakeholders. Children and young people have been interviewed when attending class right before transition in spring/summer 2021 (first data collection period) and when attending class right after transition in autumn/winter 2021 (second data collection period). The data collection of interviews with teachers and national stakeholders took place in all participating countries in late summer and autumn 2021.

Whereas parts (2) and (3) of the research on ICT in education were planned right from the beginning of the DigiGen project in 2019, the exploratory COVID-19 add-on pilot study was implemented early in the project's timeline. Since it quickly became obvious that ICT in education is highly affected by changes and developments induced by the pandemic situation, all DigiGen research groups from the five participating European countries agreed to add a pilot study in the research design of the education-related work package in order to grasp these developments from the perspectives of children and young people.

This deliverable is dedicated to task 5.1, the interview study. Results and more detailed descriptions of task 5.2 (video workshop) and the COVID-19 add-on pilot study were also prepared and published during the project (Casamassima et al., 2022; Eickelmann et al., 2021), and form a starting point for future analyses and publications (e.g. Eickelmann et al., in preparation; Labusch et al., in preparation). The COVID-19 add-on study preceded the interview study and contributed to the adaptation and further development of the main survey instruments in task 5.1, while the video workshop provided further complementary evidence. While this deliverable is dedicated to part (3), task 5.1, the results of task 5.1 should not only be considered in the context of task 5.1 only, but also include parts (1) and (2). This is especially true in the interpretation of the overall results and policy recommendations (**see Section 6**).

After completing the fieldwork of the **(qualitative) interview study (task 5.1)**, as described above, the data was transcribed. The overarching analytical approach applied was a qualitative content analysis. For data pertaining to children, young people and teachers, category systems were prepared deductively in collaboration with all participating country teams, with inductive categories drawn from the data during the analytical procedure. As national stakeholders across the five participating European countries come from a variety of backgrounds in order to provide a wide range of expertise, each country's team independently conducted qualitative content analysis to produce context-sensitive findings.

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[1] As an exception, depending on different training institutions in different countries, individual teachers participate whose focus is on both school levels. In that case, this is indicated in the text.

On the basis of the data from the interviews with children and young people before the transition (first data collection period) and after the transition (second data collection period), a cross-case analysis has been conducted. Further, a country-specific presentation of results based on the children and young people's data is realised through narrative reports.

In order to include the perspective of teachers and national stakeholders, a cross-country comparison has been conducted of the data of the semi-structured teacher interviews and a summary analysis of the data of the semi-structured national stakeholder interviews from different areas of the participating countries.

Main findings of work package 5 (ICT in education) research

Along the eight sub-research questions, and making use of the data of the five DigiGen countries involved in work package 5, the following main findings across all five countries could be elaborated upon, and commonalities and differences could be shown between the participating countries. The findings presented here are part of the more holistic and extended DigiGen deliverable 5.1, which is to be published on the DigiGen website as a working paper. The focus in this section is on the results that can be identified across countries. Country-specific results are addressed in the detailed section or, in cases where there are major differences between the countries, are explicitly stated.

1. How is ICT used in different settings before and after transition into a new formal educational phase, and which children and young people, taking into account socioeconomic characteristics and cultural backgrounds, profit from which kind of setting?

    - With regard to the access and availability of hardware, as a necessary requirement for use for children and young people at school across all five participating countries, desktop computers and laptops are the devices most likely to be mentioned. Some children and young people report that they have limited access to hardware at school. While some indicate they have access and availability to devices such as mobile phones, many children and young people need to have these switched off and in their bags during school hours. In some cases, only teachers have or use a device such as a laptop in class. Almost all of the children and young people report having access to and availability of mobile phones outside school. A large proportion of children and young people also state that they have access to desktop computers and laptops, as well as tablet. It turns out that, even though it is a small sample, background characteristics do play a role, as some children and young people report seeing differences in access to ICT among classmates as a barrier to participation in pandemic-induced distance learning formats. However, in particular, emphasis is put on the contexts created by the educational systems that have the power to compensate for this disadvantage, for example, at the school level.

    - With respect to the access and availability of software for children and young people in school, collaboration platforms and learning management systems are most frequently mentioned. However, children and young people reported access to software to different extents. Office applications, educational platforms and video conference tools are also mentioned, but to a lesser extent. Outside school access and availability of learning management systems and search engines play a role, and access to video conference tools, collaboration platforms and presentation programs are also mentioned often.

    - For school-related purposes, ICT is used inside and outside school for collecting and evaluating information, but also to check homework and assignments on platforms and for subject-specific websites and apps.

    - In terms of content creation, ICT for school-related purposes inside and outside school is most likely to be used for writing assignments, and it is also often used for digital presentations in school.

    - For interaction and communication, ICT is most likely to be used in school for communicating with teachers, quiz apps and programs, and is used outside school on collaboration platforms. This is the case in all five participating countries.

- There is access to and ability to use different types of devices and software in all participating European countries, as well as differences regarding the range of digital devices, Internet connection and school levels.

- Disparities among children and young people emerge in terms of ICT access outside school across both levels, before and after transition.

- There is a variety of beneficial aspects of ICT use in education, and different risks and challenges associated with the use of ICT were identified in all of the participating countries, such as cyberbullying, fake news and (mental) health issues.

- In some of the schools that the respondents attend, risks arising from using ICT are addressed. However, differences between and within countries can be seen in the extent to which risks are addressed.

- Teachers use ICT beyond actual teaching and learning in lessons themselves, referring to teacher collaboration, preparations, organisational issues and classroom management, as well as the general benefit of ICT as a time-saving tool enabling more flexible and individual teaching.

2. How do children and young people at different ages rate and assess the value of their education in terms of preparing them for future life in the digital age, and are there any differences in the way that children and young people from different backgrounds assess their education and the extent to which the latter influences their perspectives?

- In terms of their attitudes towards ICT use in education, children and young people state that the **most liked aspects** of ICT use are that it is helpful in learning, facilitates their work and saves time. The **most disliked aspect** is, above all, technical issues, but also the fact that it is a possible distraction and can hinder concentration.

- In terms of children and young people's views on the **relevance of ICT beyond the school context**, communication plays a major role. These technologies are also known to play an important role as part of a future job, though this notion is developed and concretised to different degrees by the children and young people in the different countries. The role of ICT to develop one's own learning interests in nonformal settings is reflected, above all, in statements on self-education.

- From the perspective of children and young people, differences can mainly be found within the school settings, i.e. as pertains to the equipment as well as the competences and willingness of the different teachers.

3. What do children and young people in different transition phases consider to be threats (risks) in terms of their own ICT use, and how can schools address these threats?

- Regarding **digital responsibility and data protection**, lessons discussing online safety and password safety are mentioned as it pertains to privacy and data protection. The consideration of the moral and ethical consequences of publishing information online is often related to uploading photos.

- Regarding the aspect of **online identity**, most children and young people state that cyber-bullying is not an actual problem. While source awareness is mentioned in the context of critical literacy, children and young people are familiar with concepts of copyright.

- In the context of **familiarity with digital technology**, children and young people rate themselves overall as being medium to highly self-confident. They are also curious about new ICT.

- In connection with **mental health, well-being and stressors**, social disadvantages during the COVID-19 lockdown and the aspect of tiredness are mentioned by children and young people.

- In the context of **educational transition phases**, children and young people, before transitioning to lower secondary education, expect an increase in ICT use, but rather less to no change in usage pattern. On the other hand, they fear an increase in difficulties when using ICT. Children and young people after transition indicate a perceived increase in the use of ICT, but otherwise no significant changes.

4. What do children and young people consider the main potential of ICT use in different transition phases and do their schools contribute to that?

    •   The main **benefit** for children and young people using ICT in school is its usefulness. The availability of online information is also considered beneficial across both levels, before and after transition.

    •   There are different **strengths** of ICT in education, teaching and learning with and about ICT mentioned, such as an increase in children and young people's motivation, more freedom, flexibility, etc., across both levels before and after transition.

    •   Information and communication technologies can foster more individualised learning and promote an understanding in which everyone does not have to perform and reach the same levels, before and after transition.

    •   The **challenges** in ICT use for school-related purposes that children and young people before and after transition address most often relate to technical problems and their lack of concentration and ability to focus when using ICT during classes. Concerning risks arising from ICT use, children and young people see the dangers in Internet safety and malware. Regarding dangers of ICT use in the school context, they state that any dangers are well-known and there is no need to learn more about them.

5. How do children and young people evaluate their teachers' and schools' views and their capacity and readiness to support the younger generation in preparing them adequately for the digital age?

    •   Regarding **teachers' readiness to teach with and about ICT**, children and young people describe their teachers' digital competences as positive overall, but teachers responsible for classes right before transition are not adequately prepared, in some children and young people's opinions. They also indicate a high level of diversity between their teachers in terms of ICT use. Overall, teachers' frequent use of ICT is indicated; however, it is also shown that there are large differences between teachers and ICT use depending on the teacher's age.

    •   The **support of children and young people in using ICT for school-related purposes at school** is provided by teachers in the first place, although sometimes partly limited or non-existent. Peer support, in terms of support by classmates is also often mentioned by children and young people. Outside school, parents or teachers mainly provide support.

    •   The data clearly shows that there are differences in teachers' ICT knowledge and skills, and that, among the teachers, there are those that the children and young people wish were more ICT skilled.

    •   Teacher training and continuous professional development have been predominant and described as being vital for successfully and sustainably implementing ICT in education.

6. What are the long-term effects of the availability of digital media, specifically including the Internet, on cognitive skills? While previous cross-country results have been presented, the data for research question 6 reveal major differences between countries, as addressed below:

    •   Regarding long-term effects of the availability of digital media, specifically the Internet, on cognitive skills, helpful aspects for children and young people's school-related activities are put in the foreground.

    •   The results from the data collected in Estonia stood out in this area, indicating that children and young people suffer from anxiety, learning difficulties and behavioural problems, which might be related to developments of the digital age. It is also highlighted that the physical reality is sometimes no longer in balance with digital environments.

    •   With regard to teachers' evaluations of mental health stressors for themselves, increased stress and additional work were highlighted by teachers across all participating countries.

- Teachers in Germany, Estonia and Romania indicate that working time has moved into personal time and that teachers are often contacted 24/7, which leads to additional stress.

- Teachers in Estonia argue that excessive ICT use can decrease the quality of sleep and that headaches, hurting eyes and poor eyesight can be consequences, as well.

- However, regarding the long-term effects, teachers in Estonia report that being able to use ICT does not necessarily mean they will be prepared for the future, going along with reports by teachers in Norway highlighting that the digital future is not known and thus it is challenging to know how to prepare the younger generation for a digital age.

- When it comes to teachers' evaluations of mental health stressors for children and young people, all participating countries, except Greece, reported that ICT might lead to children and young people having less concentration due to having too much cognitive load.

- Teachers from Estonia also state that children and young people before transition mainly learn how to be creative digitally, how to summarise and sort information, how to evaluate information critically and how to refer to sources. In lower secondary level, after transition, they mainly learn how to differentiate important from non-important digital content, how to present information using ICT, how to work with classmates, how to work through sources critically, and also about self-expression and developing their motoric and designing skills.

- In terms of risks, teachers in Germany teaching after transition add that younger children and young people especially need physical movement, which is perceived as contradictory to using ICT. Data from Norway particularly points to the risks of addiction to ICT, as stated by teachers teaching before transition.

- Referring to sustainable long-term effect associated particularly with pandemic-induced, increased ICT use in education, teachers estimate that the pandemic has given digitalisation in schools a boost, and most of them want to maintain the digital teaching and learning elements introduced due to the pandemic and resulting school closures.

- The aspect of an unknown future, especially when it comes to ongoing technological transformation, poses challenges to the teachers when thinking about long-term effects.

- With regard to the possible long-term effects of the increased use of ICT due to the pandemic, teachers primarily expect to see an increased integration of ICT in the future in the teaching context. Furthermore, a change in teachers' attitudes towards the integration of ICT in teacher training and especially in the collaboration between teachers is expected, as this can be simplified and made more flexible through ICT.

- While in Romania too, the long-term impact of ICT closely relates to the impact of the pandemic, it is mainly referred to the phase before the transition. It is highlighted in particular that COVID-19 and related distance learning formats had an emotional impact on some children and young people, as some of them had problems adapting to new classmates or changes, and they also point to health problems, such as deterioration of vision due to excessive ICT use.

- In Greece, teachers before transition argue that familiarity with using ICT for schoolwork purposes is gained by children and young people, while teachers after transition state that ICT might also have contradictory long-term effects as those with some competencies can get even better, but those deprived can be further excluded.

7. How do other school actors, e.g. teachers and relevant stakeholders, evaluate and rate school education and its capacity to prepare young people for the digital age at relevant phases and transitions?

- Some teachers express concerns when it comes to the school education and its capacity to prepare young people for the digital age, such as digitalisation getting out of hand, traditional ways of teaching and learning not being used anymore, etc.

- There are several competences that are considered important for children and young people in the future, such as a goal-oriented way of using digital devices, a critical reflection on digital media and becoming a good digital citizen. These are reported by teachers across both levels, before and after transition, as well as national stakeholders.

- Teachers in all participating countries across both levels agree that schools do have a huge responsibility in preparing children and young people for living and working in the digital age.

- From teachers' data and national stakeholder data, the need for a paradigm shift in teaching and learning emerges in order to allow ICT to be fully implemented as more flexible learning forms.

- Using information and communication technologies in educational settings is reported to provide a great power in escalating the knowledge or learning of children and young people by teachers before and after transition.

- Using information and communication technologies is reported to offer more efficiency, particularly for teachers when preparing and conducting their lessons. In terms of efficiency, ICT is reported to be beneficial when collecting information in regards to the performance of children and young people.

- From the teacher's and the national stakeholder's perspectives, apart from providing ICT for everyone, emphasis is put on providing guidance and support on how ICT can be used beneficially. This might not only include children and young people, but also their parents and caretakers.

- Teachers across both levels report that teaching and learning with ICT needs to be carefully planned, and the pedagogical and learning aspects of the technology should be considered. This is a theme that is also emerging from national stakeholder data.

- Teachers across both levels report that ICT has enormous potential for fostering imagination, autonomy and creativity of children in the context of their education (and beyond), but the involvement of teachers and parents is paramount in order for them to realise their potential.

8. To what extent do the relevant actors take into account differences in children and young people's backgrounds and characteristics?

- Children and young people who do not have good access to digital devices or simply do not use them at home are often disadvantaged in class and lack important skills that other children and young people bring to class.

- Teachers are faced with various challenges when it comes to integrating ICT in education, on the individual level as well as the administrative level.

- Challenges with integrating ICT can also arise in the context of transition phases, as some children suffer a disruption in their digital education during the transition, which needs to be prevented.

- Teachers share experiences of deepened educational inequalities related to the pandemic's impact and the necessary distance learning formats, where a gap between less and more advanced children and young people is widening when it comes to equipment with digital devices. This is due to the fact that not all of the schools where the participating teachers worked were able to provide children and young people with necessary equipment (including stable Internet) to keep up with learning.

- Teachers express wishes for concrete strategies for ICT implementation, ICT infrastructure, technical and pedagogical support and toolkits to integrate ICT in teaching and learning.

Relevance of results to policy and practice

Summary of research results for EU policy use

The findings in this deliverable reveal various conditions contributing to children and young people benefitting from, and being negatively impacted by, ICT use. It considers the inequalities in background characteristics and, particularly, characteristics at both the teacher and school levels. Thus, conditions can be identified on three different levels: the children and young people level, the teacher level and the school level.

At the **level of children and young people**, beneficial aspects include the great potential of Internet use to learn more, get answers beyond textbooks and discover new things. In this context, video platforms offer learning material that goes beyond the school material, addressing individual needs and supporting individualised learning. In terms of promoting individual learning, learning apps enable children and young people to assess their own performances and identify weaknesses to improve. Beyond research and consumption, the digital content creation, in particular, offers the potential for promoting imagination, autonomy and creativity. In addition, a beneficial aspect is having school-related materials stored and available in one place, referring to learning management systems and school clouds. In some cases, this includes digital devices that are owned or provided by schools. Another benefit is the frequently mentioned ease of not having to carry heavy materials. In the context of social inclusion, ICT use enables children and young people to network with each other and with teachers.

One harmful aspect at the **level of children and young people** is that there are differences in each individual's access to digital devices that are available at home to do homework, engage in school networks or participate in (pandemic-induced) distance learning formats. Inequality in access associated with educational inequality is related to differences in the children and young people's socioeconomic backgrounds, sometimes resulting in circumstances that limit their access to ICT. These differences can increase the risk of children and young people falling behind, not only in learning but also in socialisation. Due to the periods of distance learning caused by COVID-19, the risk of desocialisation was particularly evident, with children and young people expressing a desire for face-to-face contact rather than online-only contact. In this context, children and young people have also reported the risk of cyberbullying and social exclusion, in general. Another risk relates to the possibility of an online virus, becoming a victim of a hacker attack and data protection, especially in relation to the use of social media. Many children and young people are also either simply aware of the possible physical effects of using ICT or have personally experienced how excessive ICT use and screen time can lead to fatigue or even eye pain and headaches. Lack of digital skills can prevent children and young people from using the full array of the various ICTs available. The availability of the Internet or leisure apps on digital devices is also perceived as a challenge, as it creates great potential for distraction on digital devices, which can be challenging for learning. Further, children and young people do not appreciate when too many (and different) digital solutions are used. Instead of helping them, an excess of digital solutions creates confusion and unnecessary stress.

At the **teacher level**, a beneficial aspect of ICT is the opportunity to work with a variety of appealing materials and methods in the classroom through ICT use. Teachers' organisation and classroom management were also mentioned as a strength of ICT, as lesson plans and results can be documented and stored for easy access for years to come. This can be seen as smart and sustainable work. Cooperation between teachers can be facilitated through ICT, creating new opportunities and more flexibility. Frequently mentioned benefits also refer to ICT as a time-saving tool for teachers and for teaching, provided that the technology works properly, especially the Internet connection.

However, various harmful and problematic factors can be identified at this level. These include differences in understanding and being open to ICT use in school, both between individuals and between generations and subjects. In addition to attitudes, digital skills and confidence also differ between teachers, making teaching with and about ICT more difficult. This affects children and young people's preparation for the digital age. In this context, reluctance to use the ICT because of a lack of necessary know-how, especially in relation to data protection, makes teachers vulnerable in this area, and limits their willingness and ability to use the potential that ICT can garner in school and the classroom.

At the **school level**, the effort and strategies to provide schools with ICT infrastructure, especially in the context of COVID-19-related distance learning formats, can be highlighted as a benefit. Digitally advanced schools – where every teacher, child and young person is equipped with school devices and ICT is an integral part of daily teaching and learning, thereby promoting ICT inclusion – emerge as being particularly beneficial. Further ways of continuous professional development in terms of integrating ICT in teaching and learning, supported and organised at the school level, are considered beneficial, although findings indicate differences within and between countries as such concepts of continuous professional development at school level are applied to different extents.

Differences in IT equipment and infrastructure can be highlighted as being harmful at the school level. This can result in teachers not having the same opportunities to teach with and about ICT, and thus not having the same opportunities for children and young people to work digitally, learn about ICT and develop digital skills. Also, administrative barriers are mentioned when it comes to support strategies reaching the classroom.

Summary of research results for UN Sustainable Developmental Goals

In the context of this deliverable, the research findings relate to the following UN SDGs:

SDG 3: Good health and well-being. This goal can be addressed by considering how ICT use can support meaningful interactions, such as participating in (online) communities and supporting one's feeling of belonging.

SDG 4: Quality education. The goal of quality education includes, among others, embracing a student-centred approach to digital learning in teacher education, relying on participatory manners of learning and school improvement processes, making use of democratic and student active digital learning approaches in a future-oriented school culture, putting forth effort in digital responsibility and supporting it through school learning, supporting teachers' transformative digital competence, and developing teacher collaboration and a culture of sharing.

SDG 5: Gender equality. This goal promotes equality between men and women in all societal spheres, including the domain of education, by empowering girls and young women and preventing digital gender gaps.

SDG 8: Decent work and economic growth: This goal can be achieved when education provides the preparation needed for working life. This includes skills and competences that are needed in the future.

SDG 10: Reduced inequalities. This goal refers to ensuring that all children and young people are equal in their school digital learning and ensures adequate IT equipment and infrastructure in schools.

Moreover, SDG 1: No poverty – although it is not elaborated on in this working paper – is not linked to the research results within the domain 'ICT in education'. It has been adequately elaborated on via the DigiGen project's scoping review (Barbovschi et al., 2022).

Summarising results for best practice

Aiming to provide direction and evidence-based guidelines for the academic and decision-making stakeholders, the following eight best practices and recommendations can be extracted from the findings:

Ensuring adequate IT equipment and infrastructure in schools: This includes providing IT equipment and IT infrastructure that goes beyond hardware. It is also important to include digital learning materials and provide access to learning management systems for schools and all children and young people. Furthermore, enriching educational tools incorporating digital skills acquisition is needed, as is technical and pedagogical support for teachers.

Involving all children and young people equally in school digital learning: In this context, the importance of supporting schools in including all children and young people in digital learning becomes apparent. There is a special focus on including children and young people from disadvantaged backgrounds. Furthermore, additional support (financial and personal) should be provided to schools with children and young people from challenging backgrounds.

Embracing a student-centred approach to digital learning in teacher education: Here, emphasis is placed on collaboration and co-creation (as a two-way communication). Student-oriented and future-oriented digital learning from children and young people's perspectives in teacher professional development is important, as well as acknowledging the vulnerabilities and strengths of ICT in education. In addition, there should be coordinated national efforts/ guidelines developing teachers' digital competences.

Relying on participation in learning and school improvement processes: This means integrating all children and young people in a participatory way to shape their learning and school development in the digital age. There is also a need for further and better elaboration, including the production of new material and use of innovative methods.

Making use of democratic and student active digital learning approaches in a future-oriented school culture: This means integrating all children and young people in decision-making and developments, using new forms of digital participation to facilitate individual children and young people's learning in different ways.

Putting effort into digital responsibility and supporting it through school learning: What is more, it is essential to work with children and young people on digital responsibility, starting from an early age. This should not just focus on being critical of sources, but also other aspects of being present in the digital age. There should also be investment in human resources regarding ICT in order to understand the potential and risks.

Supporting teachers' transformative digital competence: This includes providing support for teachers' agency in their professional practice, considering how they need to be flexible and able to adapt to new technologies. In addition, it fosters in-service training for teachers and communities of practice within schools. Also, professional development should be supported as a general competence that is overarching throughout subjects. It is likewise important to support a clear school leadership dedicating time to ICT training and courses to raise teachers' digital competence. Throughout the interviews conducted with children and young people, teachers and stakeholders, three aspects emerged as particularly important: ensuring quality access for all children and young people, investing in the digital skills of education staff and promoting digital literacy at all levels of the education system.

Developing teacher collaboration and a culture of sharing: Opportunities should be created for teachers to share practices in terms of dedicated time. It is also important to establish training sessions and equipment to work together and develop new ICT practices. Beyond that, there is a need for an unified database to centralise and share all educational resources. A culture of sharing and cooperation should include collaboration among teachers and pedagogical staff and, above all else, between teachers and parents.

List of abbreviations

EU	European Union
ICT	Information and communication technology
WP	Work package
SDG	Sutainable Development Goal

Country codes:

EE	Estonia
GE	Germany
GR	Greece
NO	Norway
RO	Romania

1. Introduction

Due to the progressive digitalisation of all areas of life, the world is subject to change. This particularly affects children and young people as future participants of society and the education sector as an important institution of learning and teaching. In this context, the question arises:

How do children and young people regard their education in terms of preparing them for their future life in the digital age?[2]

The research project on the impact of technological transformations on the digital generation (DigiGen), with Halla B. Holmarsdottir (OsloMet University) coordinating the scientific leadership, addresses this issue with a dedicated work package (no. 5) 'ICT in education' led by Birgit Eickelmann (Paderborn University) and co-leader Monica Barbovschi (Babes-Bolyai University). Interlinked with further work packages (digigen.eu), work package 5 focuses on the domain of education and how it is closely linked to the overall project by asking its research question, **"How are children and young people affected by the technological transformations in their everyday lives?" (see Sections 4.1 and 4.2)**.

Digital technologies that are continuously developing are increasingly determining civic participation in society and career prospects. Children and young people, although born into a digital age and growing up surrounded by ICT, do not inherently have knowledge and ICT-related competencies that enable beneficial ICT use and preparation for future life in a digital age. Today, education across Europe must meet the challenge of equipping the younger generation with the digital skills they need in order to actively participate in society (European Commission, 2020). As ICT is becoming more profound in educational and training institutions, there is a need to upgrade teachers' ICT skills so that they will be able to design activities aimed at digital literacy and make use of digital media for educational purposes. Simultaneously, it is crucial to also explore the opportunities and risks that the increased digitalisation of education may pose for children and young people. Today's digital skills should include competences beyond basic ICT literacy and should enable children and young people to manage and be resilient to challenges surrounding safety, health, violence and misinformation (fake news) while being aware of their rights in the digital world as digital citizens.

Given that human development is a lifelong process, no stage of life can be considered in isolation from others (Alwin, 2012). In this context, age-related youth development processes, which are characterised by transitions, must be considered. A transition is defined here as a complex process involving subsequent adaptation to new circumstances or environments (Rous et al., 2007). In the context of the field of ICT in education, therefore, the transition to a new formal educational phase is considered which, in some of the participating countries, can mean a major change (e.g. through a move from one school to another).

In five European countries, representing different educational systems and distinct levels of ICT infrastructure in educational institutions, research is conducted to answer the question of how children and young people regard their education in terms of preparing them for their future life in the digital age. This is done by pursuing six objectives (see Grant Agreement):

1. To assess how ICT is used in different settings before and after transition into a new formal educational phase and to establish which children and young people with which socioeconomic characteristics and cultural backgrounds profit, and which settings have the potential to support children and young people at risk.

Using ICT is at the forefront of this objective. It focuses on how children and young people use ICT at school, but also how they use ICT outside school for school-related purposes. Socioeconomic

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2   The original question in the study proposal was: "How do young children regard their education in terms of preparing them for adult life in the digital age?" Due to the different age groups in the participating countries, the term 'children and young people' is used and, instead of 'adult life,' the term 'future life' is used.

characteristics and the children and young people's cultural backgrounds are included, and which factors are beneficial or harmful are examined and considered.

2. To comprehend how children and young people at different ages rate and assess the value of their education as a preparation for their future life and for developing their own way of living and working in the digital age; moreover, to examine whether there are differences in the way that children and young people from different backgrounds assess their education and the extent to which the latter influences their perspectives.

This objective focuses on how children and young people regard education as preparing them for their future lives and how they evaluate their own development in this area. Again, characteristics of the children and young people are taken into consideration.

3. To identify what children and young people in different transition phases consider to be threats (risks) in terms of their own ICT use and how the schools can address these threats. This also addresses what they consider to be the main potential of ICT use in different transition phases and how their school contributes to that.

With this objective, children and young people's views of potentials and risks in relation to their own ICT use in schools will be explored.

4. To give children and young people the opportunity to evaluate their teachers' and schools' views and their capacity and readiness to support the younger generation in preparing adequately for the digital age.

In this objective, children and young people evaluate their teachers' skills and readiness to prepare them for their future in the digital age, and what their school offers them in this context.

5. To understand the long-term effects of the availability of digital media, specifically including the Internet, on cognitive skills by exploiting administrative data.

This objective will consider the long-term effects of ICT availability on cognitive skills, including the availability of the Internet. At this point, it must be mentioned that this objective could not be fully achieved. This was due to the COVID-19 pandemic, as the research conducted during this time was unable to provide data that would not give a skewed picture.

6. To interrogate how other school actors, e.g. relevant stakeholders, evaluate and rate school education and its capacity to prepare children and young people for the digital age at relevant phases and transitions; and the extent to which the relevant actors take into account differences in children and young people's backgrounds and characteristics.

Another objective is to involve school stakeholders. This includes teachers and national stakeholders working in education or related relevant fields who can complete the picture obtained through the children and young people's data.

To meet these objectives and answer the question of how education prepares children and young people for their future lives in the digital age raises the questions of what future digital skills are necessary for participating in society, what the school framework conditions are for acquiring digital skills, and what challenges and problems arise in acquiring digital skills at school, especially regarding the individual characteristics of children and young people.

The individual frameworks are explained in more detail in **Chapter 2**. However, it is also pointed out that these frameworks all offer points of reference and links to the development or further extension of theories within the framework of the question on how children and young people regard their education in terms of preparing them for their future life in the digital age.

When considering the current state of research, it is likewise evident that the question at hand has not yet been answered comprehensively. The scoping review (Barbovschi et al., 2022), as an essential part of the DigiGen project, outlines existing empirical findings on conditions that contribute to children and young people being either negatively or positively impacted by ICT

use. This is further elaborated upon in work package 5, which refers to the domain of education (see **Chapter 3**).

Since research shows that in-depth investigations of the perspective of children and young people are less represented and are lacking qualitative data, especially at the younger school age, the overarching question arises of how they regard their education in terms of preparing them for future life in the digital age. Chapter 4 shows how the DigiGen research on ICT in education addresses this question, and describes the participatory methodologies applied that move the focus from research on children and young people to a focus of research with children and young people as co-researchers, co-creators and co-designers. To empower children and young people to shape their own future, and thus the future of society, the DigiGen project includes children and young people as co-researchers in a Europe-wide educational context (see **Chapter 4**).

Based on qualitative data collected in five European countries, **Chapter 5** provides results on the research question at hand, incorporating the perspective of children and young people that were followed during their transition into lower secondary school. Further, children and young people's voices are complemented here by teachers' perspectives, teaching classes right before or right after transition, as well as by national stakeholders contributing a variety of expertise.

All findings are discussed in **Chapter 6**, considering their relevance to European policy and practice, particularly referring to harmful and beneficial aspects of ICT use in education in terms of conditions contributing to children and young people benefitting from or being negatively impacted by the use of ICT in education. Subsequently, results will be linked to selected UN SDGs.

2. Key theories and conceptual framework

For the theoretical grounding on how education prepares children and young people for their future life in the digital age, various models and frameworks can be used. As a theoretical basis in the DigiGen study, so-called scoping reviews have been conducted for each domain (cf. **Section 4.1**), including ICT in education. The scoping review on ICT in education serves as a literature review and framework. The data and results of the research will be used to compare, complement and contribute to the existing literature. The scoping review, systematically carried out in several steps and in a peer review process, is a task of DigiGen's work package 7, led by Idunn Seland (OsloMet University, Norway). It focuses on providing a knowledge base for future policy recommendations in DigiGen in line with the project's overarching research questions (Seland et al., 2022) (**Section 2.1**).

Beyond the scoping review, as an essential part of the DigiGen project, results of the research on ICT in education are considered within the context of theoretical, conceptual and policy-related frameworks, which help to identify thematic areas and link research results to policy frameworks aiming to advance the understanding of the ongoing digital transformation of society towards and contributing to improving educational ICT policies.

These frameworks are to theoretically locate which digital competences children and young people need to be active citizens in a digital age. Thus, it is essential to identify which digital skills and competences are needed at the European level so that children and young people are prepared. For this purpose, the European Digital Competence Framework 2.1 for citizens (Carretero Gomez et al., 2017) is addressed in **Section 2.2**.

To determine whether the school as an educational institution provides adequate preparation for the digital age, it is necessary to determine which framework conditions and processes are crucial at the school and classroom levels. For this purpose, the contextual framework of the ICILS 2018 (Fraillon et al., 2019) is referenced in **Section 2.3**, as it applies at both the European and national levels (Eickelmann et al., 2019), and therefore is particularly suitable.

Given the many facets, it is rather difficult to situate in a single model the various challenges and problems encountered in school-based digital skills acquisition. However, it is possible to draw on corresponding frameworks at the European level. To elicit what challenges and problems are encountered in school-based digital skills acquisition and how to deal with them, the framework on the European Digital Rights and Principles is considered (**Section 2.4**).

Further, the DigiGen research results on ICT in education indicate the link between the ongoing technological transformation impacting education and the achievement of the SDGs established by the United Nations. In the framework on the UN SDGs, 17 goals are established (see Figure 3), five of which are especially important to consider as they relate to the research on ICT in education: SDG 3 Good health and well-being, SDG 4 Quality education, SDG 5 Gender equality, SDG 8 Decent work and economic growth, as well as SDG 10 Reduced inequalities, to be further elaborated on in **Section 2.5**.

2.1. Scoping review on ICT in education

The scoping review, as a crucial part of the DigiGen project and a major part of work package 7, is based on systematic searching and assessing of literature within the different research domains addressed in the project, including the domain education (Seland et al, 2022). With the scoping review, the state of research is outlined on how ICT use in education bears the risk of widening the digital divide in education between children and young people, addressing the following research question:

What are the main conditions contributing to children and young people being either negatively or positively impacted by ICT use in education?

Focusing on the conditions that contribute to positive and negative impacts of ICT for children and young people, the scoping review summarises current research, particularly referring to digital inequalities across Europe with regard to ICT in education, primarily closely related to individual (age, gender, disability) and structural (socioeconomic background, ethnic minority) characteristics of children and young people's backgrounds as summed up in the scoping review, following the typology from Talaee and Noroozi (2019). Thus, the scoping review on ICT in education serves as a starting point, complemented by further theories and conceptual and policy-related frameworks necessary to situate the overall objectives and interpret the results of the present study (Barbovschi et al., 2022).

2.2. Framework on children and young people's digital competences

To determine which digital competences children and young people should have, many European countries' national curricula in this area are based on the European Digital Competence Framework 2.1 for Citizens. Regarding the framework's five competence areas – (1) information and data literacy, (2) communication and collaboration, (3) digital content creation, (4) security and (5) problem solving – there are large differences in various European countries in terms of implementing them in schools, not only between countries but also within countries (Carretero Gomez et al., 2017). However, differences emerge across European countries, e.g. while the fifth area in Norway is "Digital responsibility," in Germany, there is a sixth area called "Analysing and reflecting." Further, the competence area (5) problem solving, which is addressed by the comparatively new area of computational thinking, is not yet sufficiently implemented in schools in Germany (European Commission, 2019; e.g. Labusch & Eickelmann, 2020, 2021). Chapter 6 discusses which of these competences are considered particularly relevant with respect to preparing children and young people for their future life in the digital age.

2.3. Framework on antecedents and processes of ICT in education

As conditions contributing to beneficial or negative impacts of ICT in school are researched, the ICILS 2018 framework is considered. This framework conceptualises factors likely to impact children and young people's digital competences required for life and future employability in the digital age. To get an overall picture of what antecedents and processes for digital competence acquisition in school context resemble, the ICILS 2018 framework can be considered the base. As indicated in Figure 1, the ICILS 2018 framework distinguishes between contextual factors identified as antecedents, such as (1) ICT curriculum, (2) ICT resources and individual background characteristics of children and young people, or processes related to (3) ICT use for teaching and learning and (4) digital literacy instruction (Fraillon et al., 2019, 2020). Most relevant for the present research are the areas of (1) ICT curriculum, (2) ICT resources, (3) ICT use and (4) digital literacy instruction (cf. Fraillon et al., 2019). The framework is depicted in Figure 1.

For instance, ICT resources are listed as antecedents at the school and classroom levels. The processes at these levels include ICT use for teaching and learning (Eickelmann et al., 2019). These aspects also form the basis for the deductive development of the category system in the analyses (see **Section 4.7**).

2.4. Framework on digital rights and principles

To ensure that children and young people are adequately prepared for their future lives in the digital age, the framework on European digital rights and principles can be used. It consists of six principles: (1) people at the centre, (2) solidarity and inclusion, (3) freedom of choice, (4) participation, (5) safety and security and (6) sustainability, which are illustrated in Figure 2.
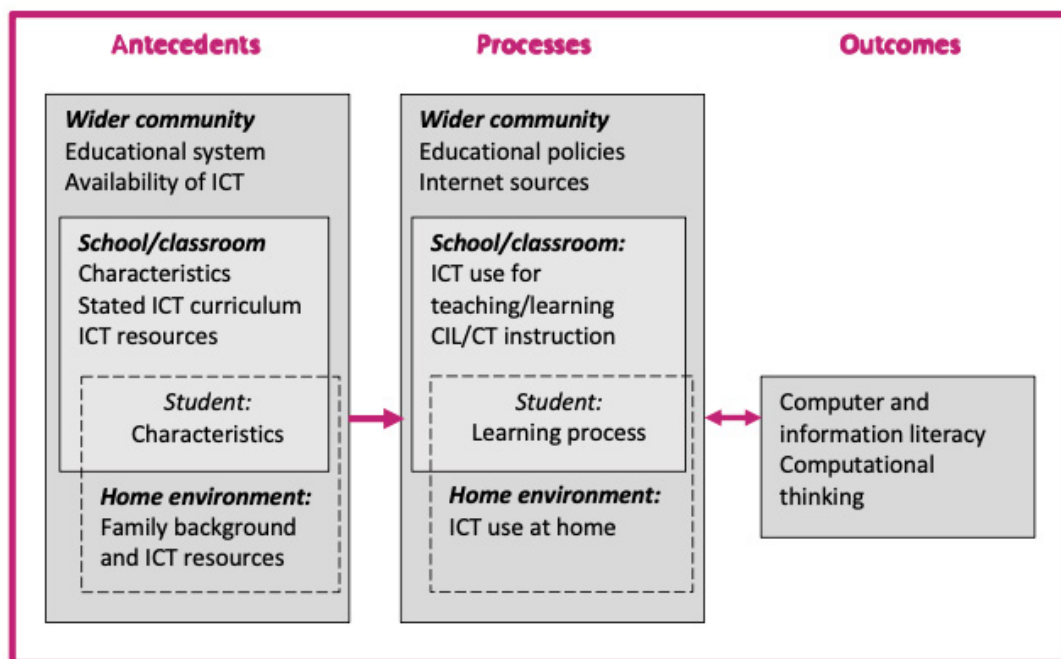
Figure 1: Contextual framework of the International Computer and Information Literacy Study 2018 (Fraillon et al., 2019, p. 34)
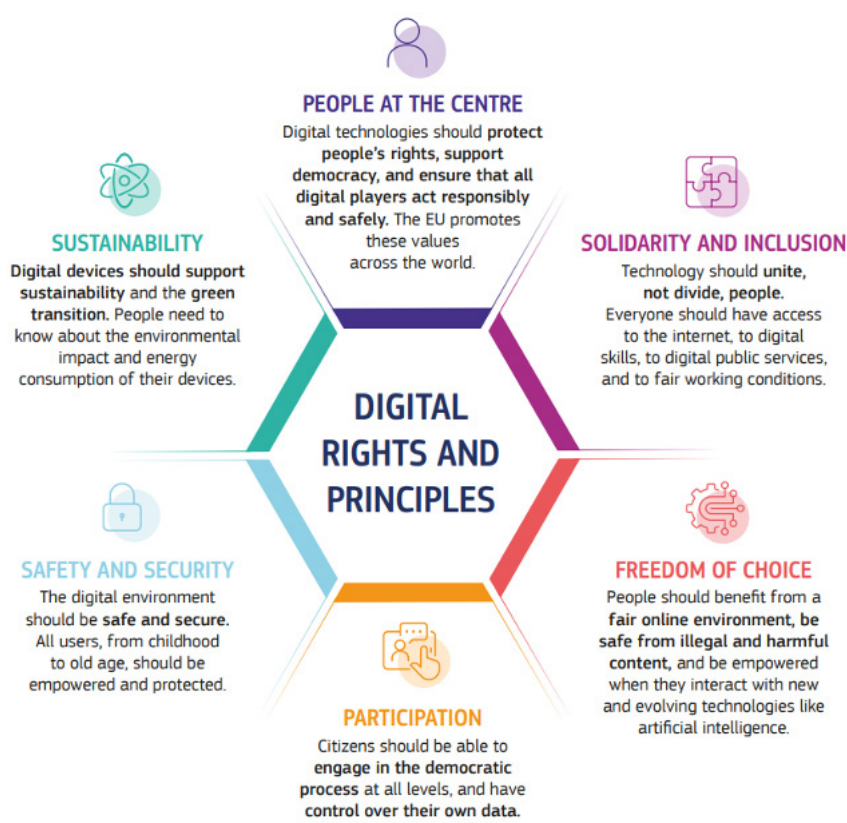
Figure 2: European digital rights and principles (European Commission, 2022)

According to the first principle, the focus of digital transformation processes should be on people. This also means that all the rights granted to people in Europe in the real world should be equally granted in the digital world. Principle (2) implies, among other things, that the

digital processes taking place in Europe should benefit everyone without excluding anyone. Since technologies are always evolving, principle (3) establishes an approach where people can use the technologies by making their own decisions. This entails informing people about the necessary content in this area. Principle (4) refers to the fact that people should be granted democracy in this digital area as well. Informing people about their rights is also part of this field. The digital right of principle (5) covers the fact that people can act safely in their rights on the Internet. This includes, for example, informing young people of how they can make decisions in their best interest or how data protection rights are not violated. The sixth principle describes the pursuit of sustainable use of digital devices. According to this principle, everyone should use technical devices, considering their environmental impact (European Commission, 2022). Whether these are also reflected in the results of the present study will be discussed in Chapter 6.

2.5. Framework on the UN Sustainable Development Goals

Seventeen goals are focused on in the framework of the UN SDGs (see Figure 3), five of which are especially important for ICT in education: (3) good health and well-being, (4) quality education, (5) gender equality, (8) decent work and economic growth and (10) reduced inequalities.

Figure 3: UN Sustainable Development Goals (United Nations, 2015)

The SDG (3) is described as one in which the world has made outstanding progress in combating various diseases and increasing life expectancy. However, raising the health of all nations must be set as a goal. This also includes well-being in education. Here, vulnerable groups have been identified as being key to ensuring health and well-being in school life (United Nations, 2015). Since access to education cannot be guaranteed in the same manner in different countries, SDG (4) aims, among other things, to ensure that these children complete their primary and secondary education by 2030. It is also important to expand educational opportunity and quality education, as well as achieving gender equity and reducing inequalities. SDG (5) aims to ensure that women are not discriminated against in any way or in any field in any country in the future and that they are equal to men in all respects. SDG (10), among others, aims to support people with lower incomes and fundamentally help people of all backgrounds, etc., in the labour market. Existing income gaps should be reduced worldwide, and inequalities (for example, in digital competences) caused by different socioeconomic backgrounds and origins should also be reduced (United Nations, 2015). Furthermore, decent work and economic growth, and sustainable, safe and inclusive cities should be ensured. The problem of a lack of jobs is one aspect that is addressed in the context of SDG (8). More jobs should be created in the future.

People of all genders should be employed in accordance with their equal dignity. It is predicted that the growth of cities will continue to increase strongly until 2050 (United Nations, 2015).

The increased integration of ICT in education has the potential to both challenge and enhance links between education, citizenship and civic participation. Particularly referring to SDG (4), Target 4.7 asks that states "ensure that all learners acquire the knowledge and skills needed to promote sustainable development" (United Nations, 2015), through global citizenship education, including being competent digital citizens. Using ICT in education has a wide potential scope and involves leveraging all technologies for quality teaching and learning.

Chapter 6 will discuss how far these development goals are also reflected in the results of the present study.

3. Current state of research and research questions

This chapter is dedicated to the current state of research, referring to the previously introduced scoping review and going beyond referring to the abovementioned theories and the conceptual and policy-related frameworks. Starting off with the scoping review as a starting point, this chapter goes on to focus on the benefits and risks arising from using ICT by children and young people, moving to children and young people's digital competences, followed by antecedents and processes of ICT in education and finally addressing the digital rights, principles and development goals at the European level (**Section 3.1**). In this context, the research questions that need to be answered within the framework of the present study are listed (**Section 3.2**).

3.1. Current state of research

With the **scoping review** – an essential part of the DigiGen project – literature on the topic of which conditions contribute to children and young people being negatively or positively impacted by their use of ICT and existing empirical findings are conceptualised, systematically identified and synthesised (Seland et al., 2022). Focusing on conditions contributing to positive and negative impacts of ICT for children and young people, the scoping review summarises the state of the art – particularly referring to digital inequalities across Europe with regard to ICT in education – closely related to individual (age, gender, and disability) and structural (socioeconomic background and ethnic minority) characteristics of children and young people's backgrounds as summed up in the scoping review, following the typology from Talaee and Noroozi (2019). When it comes to children and young people's digital literacy, research across Europe reveals differences between countries, but also within countries (European Commission, 2019). Differences among children and young people's digital competences research reveals, are linked to the above-mentioned individual and structural background characteristics. With regard to the relationship between children and young people's digital competences and their age, it is apparent that there is a lack of research on the younger age group (e.g. Aesart et al., 2015; Wollscheid et al., 2016). Regarding gender differences in digital competences and ICT use, overall, it appears that girls score better on average in computer and information literacy, and boys enjoy ICT use more than girls (Aydin, 2021; Eickelmann et al., 2019; Fraillon et al., 2020). In addition, there are hardly any (representative) studies on the relationship between disabilities and the digital competences of children and young people. However, there are tendencies for ICT to have an impact on improving the writing skills of all children and young people, regardless of whether they are disabled or not (Straub & Vasquez, 2015). Existing research across Europe reveals a close link between the socioeconomic background of children and young people and their computer and information literacy (Eickelmann et al., 2019; Fraillon et al., 2020). Likewise, children and young people's ethnic minority backgrounds affect the use of ICT in education. Overall, the relevance of considering children and young people's background in research on ICT in education emerges (Barbovschi et al., 2022).

With the scoping review as a starting point, the current state of research is complemented by further research and links to the theoretical, conceptual and policy-related frameworks outlined in Chapter 2 in order to contribute to identifying thematic areas of interest so as to contextualise the digital research findings within policy recommendations and policy-related frameworks (see Chapter 6). When it comes to the question of what **digital competences** children and young people have, there are considerable differences within and between educational systems across Europe (Eickelmann et al., 2019; Fraillon et al., 2020). In terms of the question of the competences they want to acquire at school for their future in the digital age, their individual perspectives of their digital futures can be elicited, such as the wish to find a job that involves working with advanced technologies (Eickelmann & Labusch, 2020). The consideration **of antecedents and processes** in the context of ICT in education, which are also mentioned in the ICILS 2018 contextual framework (see **Section 2.3**), reveals major differences between and within European countries in terms of the (1) ICT curriculum, (2) ICT resources, (3) ICT use and (4) digital literacy instruction. Regarding ICT curriculum, there are great differences between the countries across Europe – especially in Germany, due to the federal structure of the education system – and also within the countries. In many countries, there is a major focus on equipping schools with ICT, thereby assessing their

ICT resources. While this is satisfactorily achieved in schools in Estonia, it is particularly evident in Germany that the IT equipment is not sufficient for adequate digitisation-related learning and teaching. In Romania, according to a calculation by the Romanian Ministry of Education in April 2020, 9% of children needed a device for accessing online schooling, whereas an independent assessment determined that 32% of children and young people enrolled in school did not have access to an individual functioning device for going online for their education (IRES & FePAL, 2020). Finally, many Romanian children only had a smartphone to go online during the COVID-19 lockdown and for remote education phases (Cachia et al., 2021). There are also differences between and within countries in terms of ICT use (Fraillon et al., 2020).

Overall, no uniform picture can be drawn in the context of (beneficial) antecedents and processes of ICT in education. It merely becomes clear that there is a need for development. This also plays a major role as educational systems are still not reaching their full potential in terms of equipping schools and, as a result, this can be a risk for children, young people and teachers (Eickelmann et al., 2019). As research reveals inequalities and risks of widening a digital divide (cf. Drossel et al., 2020), for example, which is closely linked to SDG (4) of quality education as well as reducing inequalities, SDG (10). Further, the relationship between antecedents, processes and digital competences can provide information about quality education (4). Gender equality has also been taken into account by examining the relationship between gender and digital competences.

Yet, existing research did not (or hardly does) include the perspective of children and young people, lacks in-depth qualitative research, and not all of the formulated digital rights, principles and developmental goals have been addressed.

3.2. Research questions

From the state of theory and research, it emerges that there are some frameworks and research on:

- the impact of children and young people's background characteristics on their competences,
- what competences children and young people should have in their future and how these are developed,
- which antecedents and processes are relevant for learning and teaching ICT at school and what is the current status quo in this context, and
- which digital rights and principles should be granted to children and young people now and in their future lives, which development goals should be achieved (see Section 2.5), and how this is currently the case.

Still, there is little or no inclusion of children and young people's perspectives, particularly those younger than higher education. The theories and (conceptual) and policy-related frameworks, as well as the research, are based on an adult perspective and thereby possibly disregard important issues..

Accordingly, the overarching main research question to be answered is:

How do children and young people regard their education in terms of preparing them for future life in the digital age?

To answer this question, a set of eight sub-questions is focused on, covering different areas accompanied by a brief explanatory note:

1. How is ICT **used in different settings** before and after transition into a new formal educational phase, and which children and young people, taking into account socioeconomic characteristics and cultural backgrounds, profit from which kind of setting?

This question focuses on the ICT use of children and young people in and out of school with a focus on school-related purposes. The transition to another formal educational phase, as well as the socio-economic and cultural background of the children and young people, will be incorporated, and which factors are beneficial or harmful will be examined.

2.   How do children and young people at **different ages rate and assess the value of their education** in terms of preparing them for future life in the digital age, and are there any differences in the way children and young people from **different backgrounds** assess their education and the extent to which the latter influences their perspectives?

This question focuses on how children and young people view education as preparing them for their future lives in the digital age and how they evaluate their own development in this area. Different age groups (depending on the participating country, see Chapter 4) and the transition focus will be included. Again, the background characteristics of the children and young people are taken into account.

3.   What do children and young people in different **transition phases** consider as threats (risks) in terms of their own ICT use and how can schools address these threats?

With this question, children and young people's views on risks of their own ICT use at school will be explored. The focus here is on the transition phases.

4.   What do children and young people consider as the **main potential of ICT use** in different transition phases and do their schools contribute to that?

Simultaneously to the previous question, this question examines the children and young people's views on the potential of their own ICT use at school. Here, the focus is again on the transition phases.

5.   How do children and young people **evaluate their teachers' and schools' views** and their capacity and readiness to support the younger generation in preparing them adequately for the digital age?

This question will explore how children and young people evaluate the skills and readiness of their teachers and/or other school stakeholders to prepare them for their future in the digital age, and what their school offers them in this context.

6.   What are the long-term effects of the availability of digital media, specifically including the Internet, on cognitive skills?

This question examines the **long-term effects** of the availability of ICT on cognitive abilities, including the availability of the Internet.

7.   How do **other school actors**, e.g. relevant stakeholders, **evaluate and rate school education** and its capacity to prepare young people for the digital age at relevant phases and transitions?

This question involves school stakeholders. This includes teachers and national stakeholders working in education or related fields who can complete the picture that emerges from the previous six sub-questions. Within this question, the preparation of children and young people through school education for their future life in the digital age is examined from the perspective of school stakeholders. The focus is on the transition.

8.   To what extent do the relevant actors take into account differences in **children and young people's backgrounds and characteristics**?

The eighth sub-question is an extension of the seventh sub-question. It explores the perspective of school stakeholders on preparing children and young people through school education for their future life in the digital age, but with a focus on the background characteristics of the children and young people.

4. Methodology

This chapter outlines the design of the research on ICT in education and a description of the sample, preceded with the integration of this research into the project's overall context. Accordingly, the overarching project's context (**Section 4.1**) and the research domain 'ICT in education' (**Section 4.2**) are described first. Following this, the research design (**Section 4.3**), the samples and participants (**Section 4.4**), the survey instruments (**Section 4.5**), the data collection (**Section 4.6**) and data analyses (**Section 4.7**) are explained, and subsequently, it is indicated how the methodological procedure meets quality criteria (**Section 4.8**).

4.1. Project on "The impact of technological transformations on the Digital Generation" (DigiGen)

With the digital transformation of everyday life and the rapid growth of ICT, all areas of life are affected (European Commission, 2020a, 2020b; Organisation for Economic Co-Operation and Development, 2020; The United Nations Educational, Scientific and Cultural Organization, 2021). Thus, it is essential to develop significant knowledge about how children and young people use and are affected by technological changes in their everyday lives.
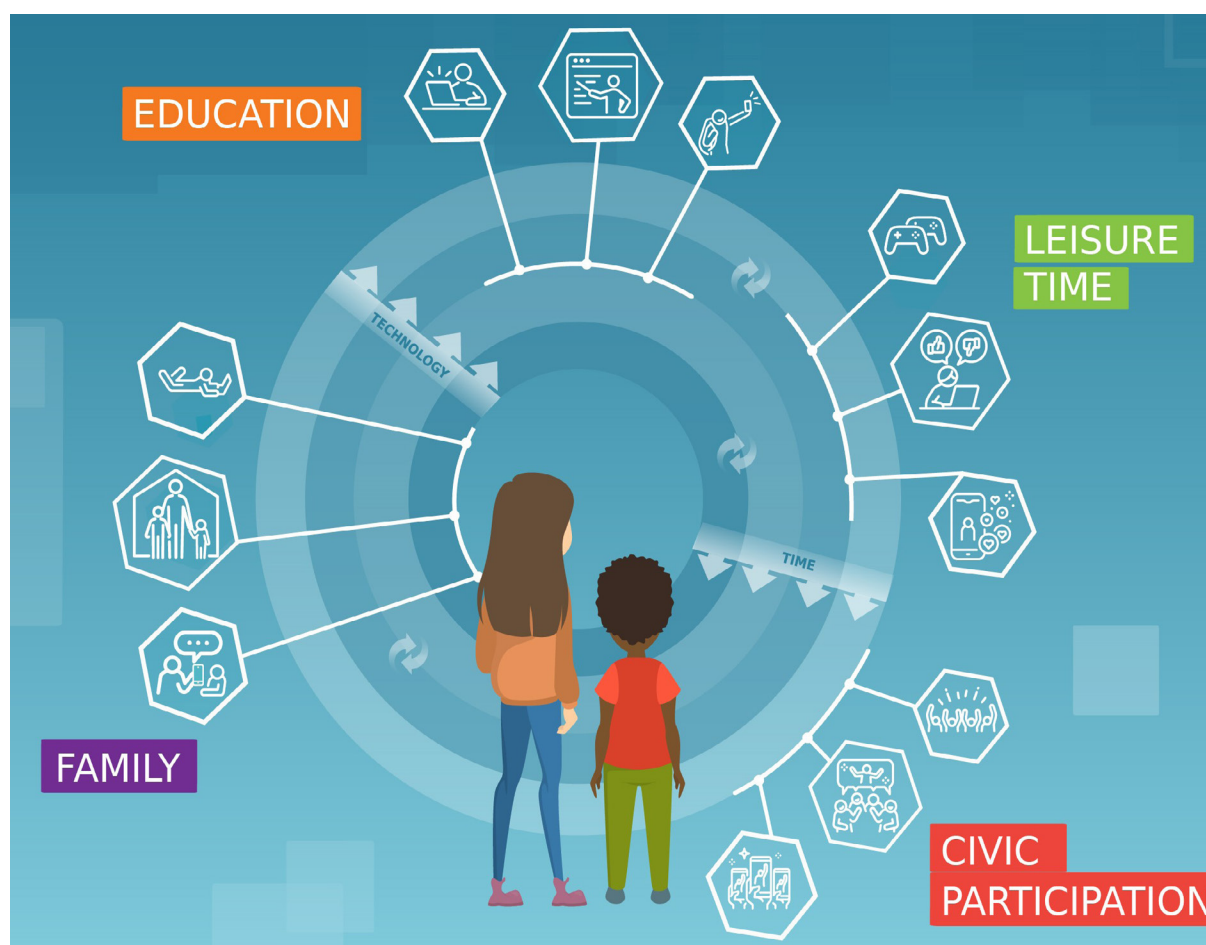
Figure 4: Research fields in the DigiGen Project (DigiGen, 2020; Casamassima et al., 2022, p. 6)

The he EU-funded Horizon 2020 project, "The Impact of Technological Transformations on the Digital Generation (DigiGen)," with Halla B. Holmarsdottir (OsloMet University, Norway) coordinating the scientific leadership, addresses this very issue by aiming to investigate the impact of technological change and ICT use on different areas of children and young people's daily lives, education, family, leisure and civic participation (see Figure 4).

The DigiGen project aims to develop knowledge of how and why some children and young people benefit from using ICT, while others seem to be impacted negatively in their everyday lives (e.g. European Commission 2020a, 2020b; Ottestad & Gudmundsdottir, 2018; van Deursen & van Dijk, 2019; van Dijk, 2020). The project's aim is achieved using participatory methods. The project focuses on children and young people (up to 18 years of age). Keeping with the collaborative ethnography approach (**see Section 4.3**), children and young people are involved as co-researchers, and several innovative methods are used within the project.

The overall project, carried out across multiple European countries, is divided into different work packages. Four of these packages (work packages 3-6) aim to generate new empirical data on the impact of digital transformations in children's and young people's everyday lives regarding family (Kapella et al., 2022), education (Eickelmann et al., 2021), leisure time (Parsanoglou et al., 2022) and civic participation (Karatzogianni et al., 2022). Information and communication technologies in education will be the focus area of the following chapters.

4.2. Objectives and research questions of DigiGen's research on ICT in education

Education, as part of children and young people's everyday lives, represents the research domain led by Birgit Eickelmann (Paderborn University, Germany). As outlined, with DigiGen's research domain 'ICT in education', six objectives are pursued (see **Section 1**). The overall research question on how children and young people regard their education in terms of preparing them for future life in the digital age is to be answered by means of eight sub-questions (see **Section 3.2**). The following table lists the objectives to which the individual sub-questions can be assigned. This is intended to ensure transparency in how the objectives are reflected in the questions.

Table 1: Objectives and research questions of work package 5

Objectives	Research questions
1. To assess how ICT is used in different settings before and after transition into a new formal educational phase and to establish which children and young people with which socioeconomic characteristics and cultural backgrounds profit, and which settings have the potential to support children and young people at risk.	1. How is ICT used in different settings before and after transition into a new formal educational phase and which children and young people, taking into account socioeconomic characteristics and cultural backgrounds, profit from which kind of setting?
2. To comprehend how children and young people at different ages rate and assess the value of their education as a preparation for their future life, and for developing their own way of living and working in the digital age; moreover, to examine whether there are differences in the way students from different backgrounds assess their education and the extent to which the latter influences their perspectives.	2. How do children and young people at different ages rate and assess the value of their education in terms of preparing them for future life in the digital age and are there any differences in the way children and young people from different backgrounds assess their education and the extent to which the latter influences their perspectives?

Objectives	Research questions
3. To identify what children and young people in different transition phases consider as threats (risks) in terms of their own ICT use and how the schools can address these threats; what they consider as the main potential of ICT use in different transition phases and how their school contributes to that.	3. What do children and young people in different transition phases consider as threats (risks) in terms of their own ICT use and how can schools address these threats? 4. What do children and young people consider as the main potential of ICT use in different transition phases and do their schools contribute to that?
4. To give children and young people the opportunity to evaluate their teachers' and schools' views and their capacity and readiness to support the younger generation in preparing adequately for the digital age.	5. How do children and young people evaluate their teachers' and schools' views and their capacity and readiness to support the younger generation in preparing them adequately for the digital age?
5. To understand the long-term effects of the availability of digital media, specifically including the Internet, on cognitive skills by exploiting administrative data.	6. What are the long-term effects of the availability of digital media, specifically including the Internet, on cognitive skills?
7. To interrogate how other school actors, e.g. relevant stakeholders, evaluate and rate school education and its capacity to prepare children and young people for the digital age at relevant phases and transitions; and the extent to which the relevant actors take into account differences in children and young people's backgrounds and characteristics.	8. How do other school actors, e.g. relevant stakeholders, evaluate and rate school education and its capacity to prepare young people for the digital age at relevant phases and transitions? 9. To what extent do the relevant actors take into account differences in children and young people's backgrounds and characteristics?

4.3. Research design of DigiGen's research on ICT in education

Keeping with the overarching research question and the six overarching objectives from which the eight sub-research questions derive, there is a need to design the research to yield comprehensive qualitative data in five European countries with different educational systems: Estonia, Germany, Greece, Norway and Romania. The study's main focus is on children and young people's perspectives, yet it is complemented by perspectives of further participant groups as illustrated in Figure 5. Figure 5 below shows the overall methodological approach within the research domain 'ICT in education'.

'Pilot Study COVID-19 Add-On'

Interviews with
- Children and young people **after** transition (N=26)

Group discussions (optional) with
- National stakeholders (N=4)

Data Collection: autumn/winter 2020/2021

Task 5.1: Qualitative Data

Interviews with
- Children and young people before and after transition (N=43)
- Teachers teaching before transition (N=17)
- Teachers teaching after transition (N=18)
- Teachers teaching both levels (N=2)
- National stakeholders (N=14)

Data collection: late summer and autumn 2021

Task 5.2: Video Workshop

Interviews guidelines (N=12) and video material produced (N=37) by
- Children and young people before transition (N=28)
- Children and young people after transition (N=22)
- Teacher candidates focusing on before transition level (N=10)
- Teacher candidates focusing on after transition level (N=11)

Data collection: autumn/winter 2021

Figure 5: Tasks in DigiGen's 'ICT in education'

The research design in the domain 'ICT in education' can be divided into three parts. Originally, two tasks were scheduled from the beginning of the project (task 5.1 and task 5.2). As the COVID-19 pandemic strongly affected education and the use of ICT in education, an additional exploratory add-on pilot study on COVID-19 was initiated. Interviews were conducted in the same five European countries (Estonia, Germany, Greece, Norway, and Romania) with 26 children and young people who were attending a class right after transitioning to a new educational phase. In addition, four group discussions were held with national stakeholders. The data collection was carried out in autumn and winter 2020/2021 (Eickelmann et al., 2020). In general, keeping with the overall DigiGen project collaborative approach (Clerke & Hopwood, 2014), it is central to the underlying study's approach that children and young people act as co-designers and co-constructors of research. From a methodological perspective, the pilot study also served to readjust the instruments for the main survey, based on input from the children and young people interviewed.

Task 5.2, a video workshop, was conducted by engaging children and young people in transition phases as collaborator, co-researchers and co-designers together with teacher candidates as the teachers of tomorrow. Participants not only designed instruments, but also collected data themselves. Video workshops were facilitated by researchers in Estonia, Germany, Greece, Norway and Romania involving children and young people attending classes right before and right after transition and teacher candidates, focusing on before and after transition level. In total, 12 interview guidelines were developed. Children and young people attending classes right after transition developed interview guidelines and conducted interviews with children and young people attending class right before transition. Also, teacher candidates developed interview guidelines and conducted interviews with children and young people of a class on which transition level they focus in their teacher training. In total, 37 videos were recorded. Data collection took place in the autumn/winter of 2021 (Casamassima et al., 2022). The video workshops have provided additional information for discussing the results in this working paper, which is dedicated to task 5.1.

In Task 5.1, to which this working paper is dedicated, the data collection is based more on qualitative interviews. Here, collaboration refers to the children and young people's inputs from the pilot study feeding into the instruments for the main study and the relationship between a researcher and those being researched. The collaboration focuses on equality in working together "at every step of the process" (Lassiter, 2005, p. 17). Collaborative ethnography represents a holistic methodological approach. The aim is to actively involve the research participants as creative contributors to the entire research process. Originating in anthropology, the collaborative approach has remained rather marginal in sociological research (Bettmann, 2022). It has developed from the critical methodological engagement with interpretative anthropology (Labusch et al., 2022). Closely related to this is the approach of reciprocal ethnography (Lawless, 1991), in which scientific interpretations are to be presented to those being researched so that they can comment critically and thus be involved in the scientific interpretation. It is not the scientist with his/her academic knowledge who has the sovereignty of interpretation, but all those who are involved in the research project (Bettmann, 2022). It is a matter of generating knowledge and competences in the research process that enable scientific as well as field-related growth. What is at stake is making fruitful the interpretative negotiations around the communing of researchers and researched (Lassiter, 2005). Central to this is that laypeople are considered to be equal partners, and that the focus is on finding common interests, the processes of communitarisation and the all-round usability of the results. Overall, the approach of collaborative ethnography pursues a very pronounced participatory research style (Bettmann, 2022), which can also be seen in the interaction of the three strands shown in Figure 5. While the pilot study precedes and serves to adjust the instruments on the basis of the children and young people's interviews and feedback, the video workshop provides supplementary information additional to the central main task and main survey Task 5.1, the interview study, which is the focus of this paper and provides the main results to answer the research question on how children and young people regard their education in terms of preparing them for future life in the digital age.

4.4. Samples and participants of task 5.1 of DigiGen's research on ICT in education

In order to address the foremost research question of how children and young people regard their education in terms of preparing them for future life in the digital age within work package 5's main study, a considerable amount of qualitative data is generated from five European countries with different educational systems (Estonia, Germany, Greece, Norway and Romania). These countries were chosen because they represent a wide range of education systems in Europe (European Commission, 2013).

In each country, interviews were conducted with at least six children or young people at two measurement points (before and after transition), with at least six teachers teaching in classes right before and after transition, and with at least three national stakeholders. The table below shows the samples in the five studied countries.

Table 2: Interview samples of task 5.1

Country	Number of children and young people	Number of teachers		Number of national stakeholders
	Before/after transition	Before transition	After transition	
Estonia	8	4*	4*	3
Germany	10	3	5	3
Greece	6	3	3	2
Norway	11	5	4	3
Romania	8	3	3	3
Total	43	18	19	14

* In Estonia, the teacher sample comprised a total of eight teachers: three before transition, three after transition and two on both levels.

Data from 43 children or young people at two measurement points (before and after transition) are available. In addition, a total of 18 teachers teaching right before transition and 19 teachers teaching right after transition were interviewed. Furthermore, results of 14 interviews with national stakeholders are included.

Overall, there were general guidelines for the sampling procedure:

The general method of snowball sampling (Cooksey & McDonald, 2019; Naderifar et al., 2017) was used to recruit children, young people, teachers and national stakeholders. Since one of the keys of the objectives and sub-questions of the present research is on the phases of educational transition, the participating children and young people in the different countries differ in age according to the different educational systems. The ages range from 9 to 16 years. To achieve the greatest possible diversity in the sample and meet another focus of the research's objectives and sub-questions, the children and young people also differ in terms of individual background characteristics. Table 3 shows the composition of the participants from each country with the assigned individual characteristics as sampling criteria.

Table 3: Composition of task 5.1 children and young people sample

Country	N.º of children and young people	Age range	Gender		Migration background		Socio-economic status		
			Female	Male	Yes	No	High	Middle	Low
Estonia	8	15-16	4	4	-	8	2	4	2
Germany	10	9-10	5	5	2	7	5	2	3
Greece	6	12-13	3	3	-	6	1	5	-
Norway	11	12-13	3	8	-	11	6	5	-
Romania	8	10-12	6	2	-	8	4	4	-
Total	43	9-16	21	22	2	29	18	20	5

The table shows that there is an age range between the youngest children (9 years) in Germany and the oldest young people (16 years) in Estonia. This range is due to the fact that the study's focus is on the educational transition phases into lower secondary level and the various countries differ in terms of the ages in each of their respective transition phases. The transition from primary to secondary school takes place between grades 4 and 5 in Germany and Romania, 6 and 7 in Greece, 7 and 8 in Norway, and 9 and 10 in Estonia. In the sample, attention was paid to drawing a variety of children and young people in terms of gender, migration background and socioeconomic status, so that the resulting data would be as diverse as possible.

More detailed information on the children and young people can be found in the presentation of results in the form of narrative reports (**see Section 5.2**).

In addition, when recruiting the teachers, attention was paid to the principle that they should already have some teaching experience because they were thus assumed to have a certain overview of school processes. In addition, diversity in the teacher sample was considered in terms of age, gender and the location of the school where they taught.

In addition to these general sampling criteria, country-specific sampling is available in some of the participating countries.

4.4.1. Country-specific sampling in Estonia

In Estonia, it is common practice that teachers can either teach before or after transition levels or on both levels. This was considered when forming the sample, as it consists of eight teachers, two of which teach on both levels. The sample also reflects both large urban schools as well as small rural area schools. In addition, schools providing education in both levels (before and after transition) as well as only before transition (up to 9th grade) were involved. As education in some of the Estonian schools is also provided partly in Russian, a teacher from this type of school was involved.

The sample consists of five female and three male teachers aged 31 to 63 that have been working as teachers from 2 to 43 years. The subjects taught varied from history and social studies to different languages (English, French and Estonian), mathematics, biology and chemistry. Some teachers also taught entrepreneurship, basics of research, media and other optional courses. Computer/IT teachers were not invited to participate as this might affect the results.

Two strategies were used to invite the teachers to participate in the study. Firstly, schools with a suitable background (urban/rural, large/small, levels of education provided) were contacted. A call to participate in the study was shared internally within the school and the contact details of teachers interested in participating were forwarded to the researchers. Secondly, the snowball sampling method was used with a focus on finding new participants in other schools. Altogether, teachers from eight different schools across Estonia gave their consent to participate in the study.

Each participating teacher signed an informed consent sheet. The Ethics Committee of Tallinn University approved it beforehand, and it provided all the necessary information regarding the DigiGen study and the participants' rights in the context of the interview.

4.4.2. Country-specific sampling in Germany

In Germany, as in the other countries, emphasis was placed on the samples' heterogeneity in order to obtain the broadest possible results. Here, the children and young people were considered, above all, in terms of gender and socioeconomic and migration backgrounds, as well as the geographical location of their places of residence.

The samples of teachers took gender into account, but also focused on having different age groups with different teaching experiences. Also, the subjects that the teachers mainly teach ranged across all subject areas, thus providing many different insights in the results. One aspect to be emphasised for Germany is that it has a federal system, and education policy is the sovereignty of the individual federal states. Accordingly, care was also taken to ensure that the schools at which they teach are located in different federal states in order to obtain a wide range of results.

All children, young people and teachers were contacted from the extended professional network of researchers in the DigiGen project. They were informed of the study's purpose and given the opportunity to ask questions about the research. The interviewed stakeholders in Germany also act as national stakeholders in the DigiGen project.

4.4.3. Country-specific sampling in Greece

In Greece, research on ICT in education was conducted in COVID-19 context, mainly during the first phase impacting the educational institutions with school closures in particular. This hindered researchers' access to schools and other possible participant pools, such as community centres, sport clubs and other associations. Therefore, the sampling procedure was a combination of purposive and convenience sampling. This led to a certain homogeneity of the sample. The six selected cases in Greece reflect the diversity of schools more than a diversity of the children and young people. This shows that all respondents are coming from ethnic-Greek families, with a socioeconomic status ranging from low-medium to medium-high. There is, however, a certain diversity regarding geographical distribution, i.e. three respondents from the capital, one from the second largest city and two from medium-sized cities. Moreover, there is a diversity regarding the types of schools the respondents attend: four attending typical public schools in different regions/districts (two in small cities, one in a working-class district and one in a middle-class district), one attending an experimental public school, and one attending private school.

The sample equally represented gender. Although variables such as ethnic/migrant background or pronounced deprived socioeconomic background are not represented in the sample, the data collected reflects the 'mainstream variation' of children's views on how the educational system incorporates ICT in its everyday configurations. As this is qualitative research with specific research questions, the data can provide useful insights into the correlation between education and ICT in the Greek context.

4.4.4. Country-specific sampling in Norway

The initial data collection was planned to take place in May 2020, but due to the COVID-19 pandemic, the data collection was delayed until May 2021 and completed in November 2022. It was initially planned to recruit participants directly through schools across the country. However, this proved difficult due to continuing COVID-19 restrictions making it difficult to visit schools. In

the end, partnership schools were used where student teachers do their teacher training during their studies and are linked to OsloMet. Also, researchers used their own research networks and social media accounts to recruit both children and young people and teachers. Informational emails were sent to 151 partnership schools along with 35 schools in the eastern region of Norway. The email aimed to recruit teachers in grades 7 and 8 and children and young people in grade 7 who could also be interviewed in grade 8. Researchers used social media focusing on groups with practicing teachers. When consent forms were collected, in total the sample consisted of 11 children and young people who were interviewed twice, once in May 2021 and again in October-November 2021. Researchers also recruited nine teachers.

4.4.5. Country-specific sampling in Romania

In Romania, attention was given to the sample's heterogeneity in terms of gender, geographical location of children, size of the locality and socioeconomic background. There were no children of migrant background included in the sample, but there was one girl belonging to the Roma ethnic minority. All children and their parents were contacted via schools from the extended professional network of the researchers in the DigiGen project. Parents and children alike were explained the study's purpose and given the opportunity to ask questions about the research being conducted and share any concerns. Consent forms were collected before the interviews.

4.5. Overview of instruments and their development

In the following study, semi-structured guided interviews were conducted as a qualitative data collection method (Task 5.1). For this purpose, an interview guide was developed, together with all participating countries for the interviews before and after the transition, for teachers and for national stakeholders, in order to enable comparability of the results between the countries. This was a long-term process, for which a task force was formed with representatives from the individual countries. Based on the objectives and the overall question, as well as the sub-questions of the research and theoretical models and frameworks, interview guidelines were developed for children and young people before and after transition, with one for teachers and one for national stakeholders. All guides were revised and further developed in several rounds. The interview guides have been translated from English into the respective national language and the interviews have also been conducted in the respective national language.

During a semi-structured interview, some interviewers took the chance to adapt the order and wording of questions according to the course of the interview or to the participants' needs, which was particularly suitable for children and young people as interviewees. This allowed the interviewers to follow the participants' lead and allowed for a more natural flow in the interviews. This required that the researchers be able to remember aspects of the interview that were addressed previously, and to possibly bring forward topics that were thought of later, if the course of the interview demanded it. This offers the advantage of spontaneous follow-up questions (ad hoc questions) for further individual elaboration. The semi-structured interview thus became systematic and flexible.

In keeping the principles of collaborative ethnography, within the video workshop (Task 5.2), children and young people were also asked to record video material where they interviewed other children and young people (older children and young people interviewing younger children and young people). Teacher candidates also interview children and young people before and after transition, using questions related to the general research questions of the study (Casamassima et al., 2022; see also appendix).

4.6. Data collection of task 5.1 of DigiGen's research on ICT in education

In order to create an atmosphere of trust, individual interviews were conducted with children, young people, teachers and national stakeholders, but in some cases, a second researcher was present for support.

While interviews were initially to be conducted face to face, the continuing COVID-19 restrictions made this challenging. In the end, most interviews were conducted via a video conferencing system. The concern that conducting interviews in this manner would produce challenges for some of the participants, especially the children and young people, to speak freely did not materialise. On the contrary, it was surprisingly easy to use a video conference system for the interviews. Using a video conference system was also easier in terms of time consumption, both regarding the time it would have taken to travel to different schools or homes of the children and young people in the capital area and in finding a time that suited everyone. This was, for instance, especially relevant for the first set of interviews with the children and young people in Norway as two researchers conducted the interviews. It was also easier given that the participants could be interviewed in a place of their choosing, such as their home or an office space. The participants appreciated this flexibility, making them feel more relaxed and interested in participating in the study. One disadvantage was that most of the researchers missed out on the possibility of personally viewing and assessing the school environment. In Norway, the only exception was a face-to-face interview conducted with a grade 8 teacher which was audio recorded only. This interview took place in a rural island community in the north of Norway. This also gave some indications of geographical differences in terms of the use of ICT in schools. In addition, no pronounced differences in lengths of answers, contributions to the interview themes or emotional expressions when comparing interviews conducted face to face or via video conference system could be detected. Yet, as with face-to-face interviews, some participants had more to share than others, so the length of the interviews differed.

Children and young people have been interviewed when attending class right before transition in spring/summer 2021 (first data collection) and when attending class right after transition in autumn/winter 2021 (second data collection). The data collection of interviews with teachers and national stakeholders took place in all participating countries in late summer and autumn 2021.

4.7. Data analyses of task 5.1 of DigiGen's research on ICT in education

After completing the fieldwork, the data was transcribed using the same transcription key for all interviews. It was left to the country teams to decide how to transcribe the interviews, but most transcriptions were produced using the software called F4 for manually transcribing audio recordings. Once transcriptions were complete, the files were de-identified and any personal identifiers were removed from the data, for instance, names of persons or institutions were replaced with pseudonyms:

Pseudonymisation was applied to anonymise the data in order to remove personal and person-related information from the research data. In this process, the individual cases were given codes that were formed according to certain guidelines.

As this is the main study within the research on ICT in education, each code starts with MS (Main Study). This is followed by the first two letters of the country name (e.g. NO = Norway) and the group of people interviewed (CYP = children and young people; T = teacher, S = national stakeholder). To indicate whether teachers teach in a class before or after the transition to a new formal educational phase, the codes also contain a corresponding addition (AT = after transition, BT = before transition). The number of the interview is subsequently added at the end.

The country code MS_EE_CYP_01 thus stands for a child or young person from Estonia who was interviewed in the main study. To distinguish all children and young people to whom this applies, the number of the interview was added and this example is case 01.

The overarching analytical approach used was a qualitative content analysis. This is a data-reducing procedure in which category systems are formed and used for analysing the collected data (see **Section 4.6**). For all three types of data – children and young people data, teacher data, and national stakeholder data – joint category systems were formed deductively in collaboration with all participating country teams, but inductive categories could also be generated during the analytical process. While the data analysis was prepared jointly in all countries through the successive development of a joint category system, each country team carried out the data

analysis autonomously. Team Norway, for instance, both worked with the data individually and then met for an intensive data analysis workshop where they discussed their interpretations and findings to develop initial categories. Inspired by Tjora (2019), they performed an inductive empirical close-coding process to reduce the risk of presumptions and theories making them jump to conclusions. They read through all the interviews and coded them according to the groups (children and young people, teachers and stakeholders). Other country teams worked in a similar manner.

This process was combined with the analysis categories (the joint category system) that a taskforce developed for all of the researchers. Once the final codes and themes were identified, each country's team went back to their data once more, collected examples and quotes from the data, and placed them under the correct categories. Once this work was completed, each country's team translated all the data from their national language to English and shared the final data analysis with the other teams.

Thus, the country teams assigned the data of the interviews with children and young people before the transition (first round of data collection) and after the transition (second round of data collection) to the categories of the jointly developed category system. The data analysed in this way were then subjected to a cross-case analysis. In the analytical process, the statements most frequently mentioned by the children and young people were extracted from each category of the category system. The results (see **Section 5.1**) serve to answer sub-research questions 1 to 6. In this type of analysis, no country comparison is drawn, but it serves to provide an overview of how children and young people regard their education in terms of preparing them for future life in the digital age.

A country-specific presentation of results based on the children and young people's data is presented through so-called narrative reports. The narrative reports form the core of the analyses and presentation of results (see **Section 5.2**). There are 30 reports (six per country) in which the results are reported narratively on a case-by-case basis (two interviews per case – for the first and second data collection). These include country-wise analysis in the five participating countries. Unlike the results of the cross-case analysis, which are intended to give an overview, the narrative reports go into detail.

In order to include the perspective of teachers and national stakeholders (addressing research questions 7 and 8), a cross-country comparison of the data from the semi-structured teacher interviews (results in **Section 5.3**) and a summary analysis of the data from the semi-structured national stakeholder interviews from different areas of the participating countries (results in **Section 5.4**) has been conducted.

4.8. Quality criteria task 5.1 of DigiGen's research on ICT in education

In the methodological process, strong attention was paid to adherence to quality criteria. Since different interviewers and researchers acted in the different countries, quality assurance criteria were applied, such as comprehensive and detailed study protocoling, training and supervision of interviewers, and self-reflection of interviewers after the interview. In addition, priority has always been given to transparency in the research process. This was also reflected in intense collaboration within and between the country teams. Task forces were formed representing each country team for various tasks (e.g. the development of a joint category system; see **Section 4.7**). The role of coordination was the responsibility of the country team in Germany. This included, for instance, first editing and finalising the interview guide based on input from the country teams; sending instructions regarding the interviews, the coding, and the work with the joint category system; general compiling of the data the different participating countries have sent, etc.

Moreover, the ethical principles were adhered to throughout the entire research. This includes the fact that all interviewees received a consent form and information sheet beforehand, were informed in detail and gave their consent to participate in the study by signing (or in the case of children and young people, by the signature of their parents), and that the data (anonymised) could be further processed.

5. Main findings of work package 5 research

Addressing the overarching research question how children and young people regard their education in terms of preparing them for future life in the digital age, results are presented in this chapter. The main findings resulting from the cross-case analysis of the children and young people's data in this study are reported in **Section 5.1**. The narrative reports then gave a case-related presentation of the results based on the data from children and young people, though in more detail (**Section 5.2**). These results are enriched with the main findings resulting from cross-country comparisons of the semi-structured teacher interviews (**Section 5.3**) and with summaries of the national stakeholder data (**Section 5.4**).

5.1. Results from the cross-case analysis of the children and young people data

Following the objectives of the DigiGen research domain 'ICT in education,' six of the previously introduced sub-research questions are addressed in this chapter:

1. How is ICT used in different settings, before and after transition into a new formal educational phase, and which children and young people, taking into account socioeconomic characteristics and cultural backgrounds, profit from which kind of setting? (See **Section 5.1.1.**)

2. How do children and young people at different ages rate and assess the value of their education in terms of preparing them for future life in the digital age, and are there any differences in the way children and young people from different backgrounds assess their education and the extent to which the latter influences their perspectives? (See **Section 5.1.2.**)

3. What do children and young people in different transition phases consider as threats (risks) in terms of their own ICT use, and how can schools address these threats? (See **Section 5.1.3.**)

4. What do children and young people consider as the main potential of ICT use in different transition phases, and do their schools contribute to that? (See **Section 5.1.4.**)

5. How do children and young people evaluate their teachers' and schools' views and their capacity and readiness to support the younger generation in preparing them adequately for the digital age? (See **Section 5.1.5.**)

6. What are the long-term effects of the availability of digital media, specifically including the Internet, on cognitive skills? (See **Section 5.1.6.**)

Furthermore, additional results related to ICT in education and COVID-19, as well as children and young people's wishes for ICT in education in the future, will be presented (see **Section 5.1.7**).

5.1.1. ICT use in different settings

This section is dedicated to the results regarding ICT use in different settings before and after transition into a new formal education phase (research question 1). It can be determined, with regard to **ICT access in school and the access and availability of hardware for children and young people**, that desktop computers and laptops are the devices most likely to be mentioned here.

"All my classmates and my friends already have a mobile phone except me."
[MS_GE_CYP_08]

"Phone, this I have in my hand right away [...] I don't bother to start the computer and then I take the phone, that from there it is faster."
[MS_EE_CYP_03

Access and availability of hardware for children and young people

"I use my mobile and tablet, but also a [desktop] computer for homework."
[MS_GR_CYP_02]

"Telephone, tablet and a laptop. The tablet I got it from the school. And I have another one that is mine."
[MS_RO_CYP_02]

"I use Kindle because I read books, a lot, a lot. I use my phone, my PC for schoolwork, and my iPad because it's comfortable to look at. So I use the usual which is quite a lot."
[MS_NO_CYP_06]

However, some children and young people also report that they have limited access to hardware at school. While some children and young people indicate they have access and availability to devices such as mobile phones, many children and young people need to have these switched off and in their bags during school hours. Also, some children and young people indicate that teachers have or use a device such as a laptop in class. Almost all the children and young people report having access to and availability of mobile phones outside school. A large proportion of children and young people also state that they have access to desktop computers and laptops, as well as tablets.

"Sometimes we use tablets. But we only have 6-7 tablets in class."
[MS_GE_CYP_05]

"We have TV sets, one in each classroom. And a laptop, which usually belongs to the teacher. The TV set is permanently in the classroom, and we use it to have interactive lessons."
[MS_GR_CYP_05]

Access and availability of hardware for children and young people

"We have the class laptop, the video projector and the phones that are ours, the students' ones."
[MS_RO_CYP_01]

"Yes, we have our own PCs. Such as Chromebook, which we actually use almost in every class."
[MS_NO_CYP_09]

"And school has like its' own computer class ... perhaps one normal class and then in the library there are piles of computers."
[MS_EE_CYP_02]

"We had a learning app where we got all the assignments. It's called "School Manager" [...] only in home schooling."
[MS_GE_CYP_10]

"Now, not so much, but when we were in lockdown, during the online courses, sometimes I had to google for some information either for homework or for a project that our teacher assigned; to find some information on the Internet, to find some things and write them down."
[MS_GR_CYP_06]

Access and availability of hardware for children and young people

"…And so of course, we're organised all the way around Teams now because of home school and everything around that."
[MS_NO_CYP_06]

"Well Google, Classroom, Meet, WhatsApp."
[MS_RO_CYP_01]

"For writing homework, either Google Docs or Microsoft Word, it depends on the person. And also, if there is a need to do a presentation, then either PowerPoint or Docs' Slides"
[MS_EE_CYP_01]

With respect to the **access and availability of software for children and young people** in school, collaboration platforms and learning management systems are most frequently mentioned. However, children and young people reported access to software to different extents. Office applications, educational platforms and video conference tools are also mentioned, but to a lesser extent. Outside school access and availability of learning management systems and search engines play a role, and access to video conference tools, collaboration platforms and presentation programs are also often mentioned. Access and availability of social media and video platforms are named moderately often.

"Actually, we are only allowed to use the tablets very rarely, and often only in science or German lessons when we have to research something."
[MS_GE_CYP_05]

"Yes, we use Google [for research]. That was the easiest thing we could find. Or it was the other one that I don't remember what's called. Edge I think it's called, because Microsoft you know."
[MS_NO_CYP_06]

Collecting and evaluating information

"They show us some videos, usually on books, a kind of interactive material."
[MS_GR_CYP_05]

"On the tablet I looked up some areas that we visited during a school trip and for Science class I looked up some animals."
[MS_RO_CYP_03]

"I probably google some answers and search some information regarding the topic."
[MS_EE_CYP_01]

For school-related purposes, ICT is used not only in and outside school for **collecting and evaluating information** mainly for collecting and evaluating information, but also to check homework and assignments on platforms and for subject-specific websites and apps.

"Then we use such things like PowerPoint if we are going to make presentations, and we use Word to create texts, if we are going to create texts. Or sometimes we use Minecraft education if we're going to make things, build things and stuff like that, yes."
[MS_NO_CYP_12]

"And then from there, for example, when we programme games, you come to Scratch, where you can programme games."
[MS_GE_CYP_07]

Content creation (developing products)

"And computer, well, mostly we learn to use Excel and to do PowerPoint presentations and these things."
[MS_EE_CYP_03]
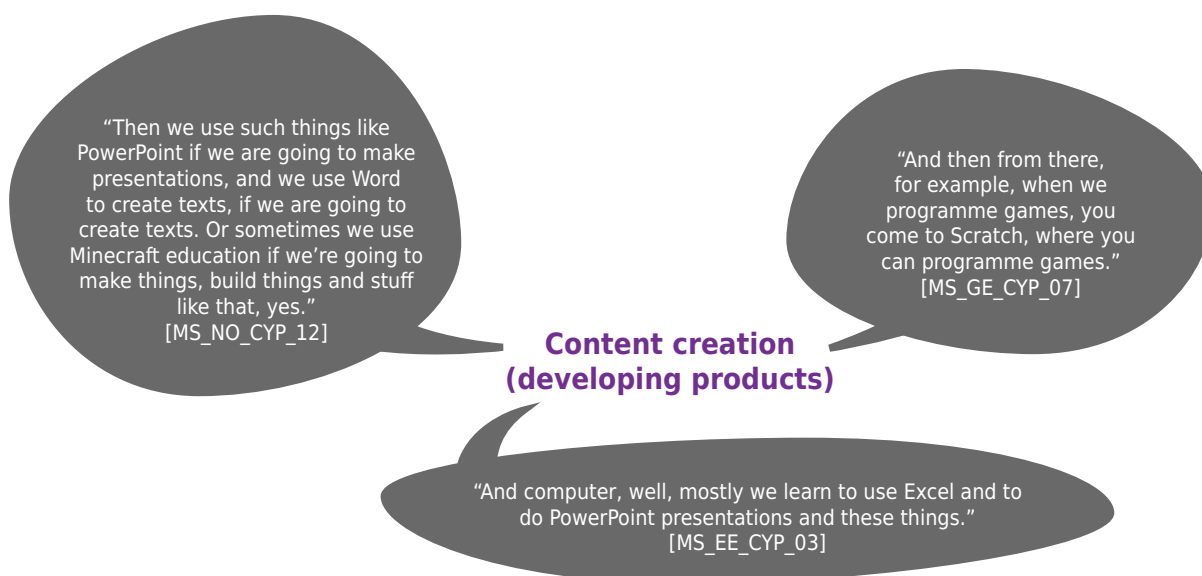
In terms of **content creation**, ICT for school-related purposes in and outside school is most likely to be used for writing assignments, and in school, it is also often used for digital presentations.

For **interaction and communication**, ICT is most likely to be used in school for communication with teachers, quiz apps and programs, and outside school on collaboration platforms.

"Today for example he showed us how to write in a folder, how to open it, to put more stuff there."
[MS_RO_CYP_04]

„Yes, we do have a padlet. The teachers upload material and homework there […].
[MS_GE_CYP_05]

Interaction and communication

"Docs, for sure. We have group works then, we use Docs"
[MS_EE_CYP_01]

"Microsoft Teams that we used for online courses or to get homework sometimes."
[MS_GR_CYP_05]

"Hmm… It is, perhaps, It's Learning. […] Because it's eh, it's pretty important to get messages. […] we get messages at It's learning and it's a bit more like that, we can see what's going on."
[MS_NO_CYP_09]

5.1.2. Attitudes and views towards ICT use in education and beyond

The following considers how children and young people rate and assess the value of their education in terms of preparing them for future life in the digital age (research question 2). In terms of their attitudes towards ICT use in education, they state that the most liked aspects of ICT use are that it is helpful in teaching and learning, helpful in facilitating work, and saves time.

The most disliked aspect is, above all, technical issues, but also the fact that it can be a possible distraction and can hinder concentration.

In terms of children and young people's views on the relevance of ICT beyond the school context, communication plays a major role in everyday life. Information and communication technologies are also seen as playing an important role as part of a future job. The role of ICT to develop one's own learning interests in nonformal settings is reflected, above all, in statements on self-education.

"In my free time I am just in social media, using Internet for it as well and reading news sometimes."
[MS_EE_CYP_01]

"Everything's technology in the world now. We couldn't have lived without technology."
[MS_NO_CYP_06_BT]

Attitudes and views towards ICT use in education and beyond

"I want to learn how to use some sites better. [...] Sites where I can write and save files. This kind of sites..."
[MS_RO_CYP_04]

"I think ICT is needed in any job. Me, I like to draw, I would like to work with manga, comics. And now, everything is done on computers."
[MS_GR_CYP_05]

"Yes, for sure, because we have already started to depend on computers, mobile phones and all that and I believe that in the future it will dominate. One will not be able to live without technology, everything will be digital. So, you have to have knowledge about it because then you cannot live."
[MS_GR_CYP_06]

5.1.3. Risks and threats in terms of ICT use in schools

Various aspects are addressed with regard to what children and young people in different transition phases consider to be threats (risks) in terms of their own ICT use and how schools can address these threats (research question 3). Regarding digital responsibility and data protection, lessons discussing online safety and password safety are mentioned the most. The consideration of the moral and ethical consequences of publishing information online is often related to uploading photos. Regarding the concept of online identity and Internet safety, most children and young people state that cyber-bullying is not an actual problem, although they are aware of its existence. While source awareness is mentioned in the context of critical literacy, children and young people are familiar with understanding the concept of copyrights. In the context of their familiarity with ICT, children and young people rate themselves as being medium to highly self-confident. They are also curious about new ICT.

In connection with mental health, well-being and stressors, social disadvantages during COVID-19 lockdown and the aspect of tiredness are mentioned above by both children and young people.

In the context of educational transition phases, children and young people before transition expect an increase in ICT use, but rather less to no change in usage pattern. On the other hand, they fear an increase in difficulties when using ICT. Children and young people after transition indicate a perceived increase in the use of ICT, but otherwise no significant changes.

"We haven't discussed any
risks"
[MS_EE_CYP_02]

"Yes. We can ruin our eyes
because we spend time on the
phone or they are not very healthy
to spend time on, because we
could very well read a book
instead of sitting and playing."
[MS_RO_CYP_05]

"We've all learned to be careful
then, and so… Yes, from my
father, I've learned how to make
good passwords and then we've
had a little bit like that and stuff
like that at school.")
[MS_NO_CYP_13]

**Risks and threats
in term of ICT use
in schools**

"If you are careful, there is no
danger."
[MS_GR_CYP_03]

"Our computer science
teacher always said that
there's a nice saying: once
on the internet, always on
the internet. That would
come to mind now."
[MS_GE_CYP_07]

"In my opinion a lot of things can be dangerous on
the internet. Like one danger can be communicating,
because when you communicate with strangers, then
there's a danger to find bad person. I am a kind of
person who very carefully checks the person, who
writes to me for example"
[MS_EE_CYP_05]

5.1.4. Main potential and challenges in ICT use

The main benefit of children and young people using ICT in school (research question 4) is its usefulness. The availability of online information is also considered beneficial for children and young people.

"That, I think […] it […]
makes me more motivated
kind of, to work well and
manage [the task]."
[MS_NO_CYP_19_BT]

"We actually couldn't
access the computers in
computer science when
we were working. You
can't always rely on them
working now."
[MS_GE_CYP_07]

"I save time, which is very important,
because we have it very little […]
emails need to be sent, I don't have
to go there, save time. It makes
everything faster."
[MS_EE_CYP_02]

**Main potential
and challenges
in ICT use**

"I like it [ICT use in school]. I
generally like to use computers;
they make things a little bit easier."
[MS_GR_CYP_05]

"Yes, especially when I do not know
something immediately, we can
find information on the internet.
For example, if we do not know a
country, we can search on Google
maps or Google and find the
information we need."
[MS_RO_CYP_01]

"It rather drags the motivation down, because you, it
happens often that a bling comes to your phone and
you are there 'oh, let's have a look what is there' […]
the whole time you should be studying goes to like
watching YouTube videos or scrolling in TikTok."
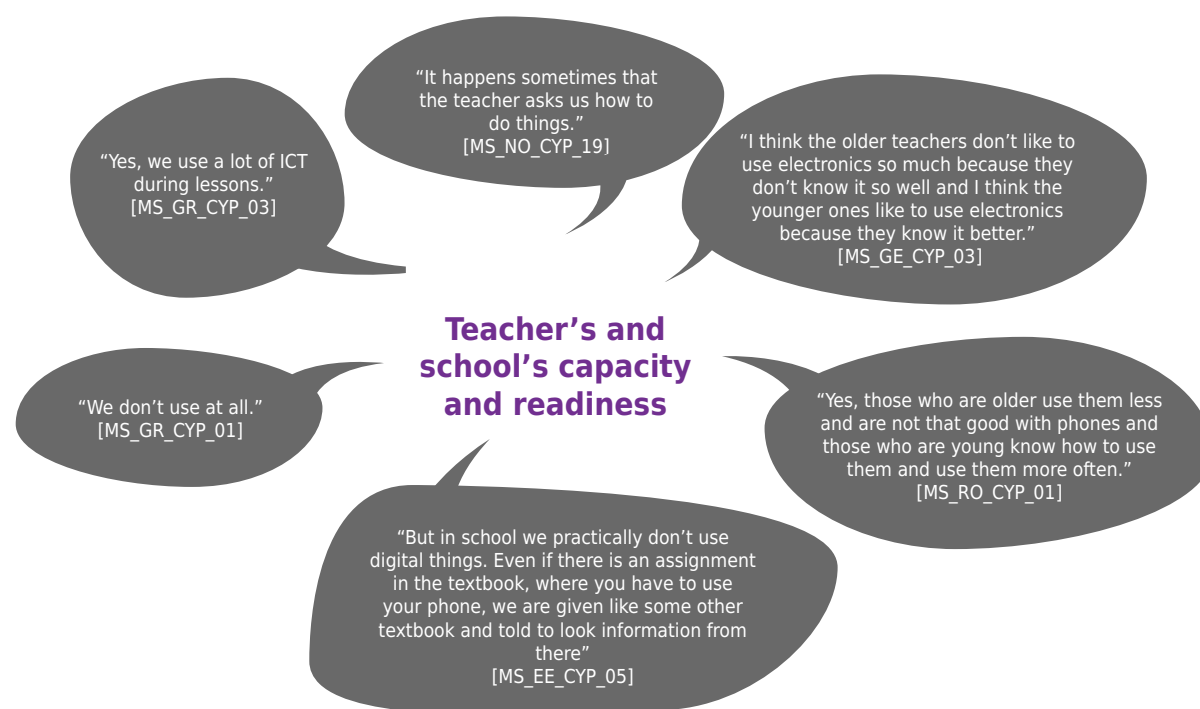[MS_EE_CYP_03]

The challenges in ICT use for school-related purposes that children and young people address most often relate to technical problems and to the potential lack of concentration and ability to focus when using ICT during classes. Concerning risks arising from ICT use, children and young people see the dangers when lacking Internet safety and encountering malware. Regarding dangers of ICT use in the school context, they state that any dangers are well-known and there is no need to learn more about them. They are also supported in teacher discussions.

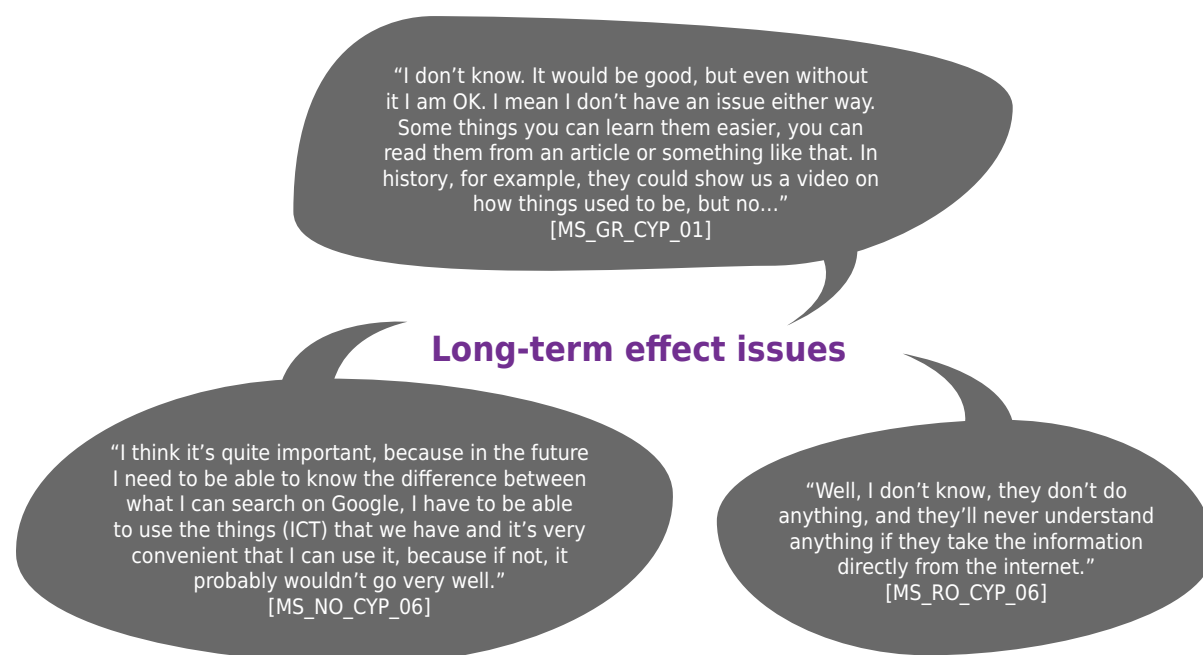### 5.1.5. Teacher's and school's capacities and readiness

The following section addresses the research question on how children and young people evaluate their teachers' and schools' views, and their capacity and readiness to support the younger generation in preparing them for the digital age (research question 5). Regarding teachers' readiness to teach with and about ICT, children and young people describe their teachers' digital competences as positive overall, but find that teachers responsible for classes right before transition are not sufficiently prepared. They also indicate a high level of diversity between their teachers in ICT use. Overall, teachers make frequent use of ICT; however, there are differences in how various teachers use ICT depending on their age.

Teachers are the most frequently reported source of support in using ICT for school-related purposes at school, however it is partly limited or even non-existent in some cases. Support by classmates is also often mentioned. Outside school, support is mainly provided by parents or by teachers.

"It happens sometimes that the teacher asks us how to do things."
[MS_NO_CYP_19]

"Yes, we use a lot of ICT during lessons."
[MS_GR_CYP_03]

"I think the older teachers don't like to use electronics so much because they don't know it so well and I think the younger ones like to use electronics because they know it better."
[MS_GE_CYP_03]

Teacher's and school's capacity and readiness

"We don't use at all."
[MS_GR_CYP_01]

"Yes, those who are older use them less and are not that good with phones and those who are young know how to use them and use them more often."
[MS_RO_CYP_01]

"But in school we practically don't use digital things. Even if there is an assignment in the textbook, where you have to use your phone, we are given like some other textbook and told to look information from there"
[MS_EE_CYP_05]

5.1.6. Long-term effect issues

Regarding long-term effects of the availability of digital media, specifically the Internet, on cognitive skills (research question 6), helpful aspects for children and young people's school-related activities are put in the foreground. These include the Internet search with search engines, which – according to a young person from Norway – is an indispensable skill for the future. Some children and young people don't quite get what long time issues there might be, others have a sceptical attitude towards this topic.

> "I don't know. It would be good, but even without it I am OK. I mean I don't have an issue either way. Some things you can learn them easier, you can read them from an article or something like that. In history, for example, they could show us a video on how things used to be, but no…"
> [MS_GR_CYP_01]

Long-term effect issues

> "I think it's quite important, because in the future I need to be able to know the difference between what I can search on Google, I have to be able to use the things (ICT) that we have and it's very convenient that I can use it, because if not, it probably wouldn't go very well."
> [MS_NO_CYP_06]

> "Well, I don't know, they don't do anything, and they'll never understand anything if they take the information directly from the internet."
> [MS_RO_CYP_06]

5.1.7. Additional findings

Findings have emerged from the children and young people's data. However, there were further results in connection with COVID-19 and wishes concerning ICT in and for school. Changes in how school is organised due to COVID-19 can be seen in the use of online teaching and an overall smooth transition to online platforms during school lockdown. In addition, an increased use of ICT due to COVID-19 is indicated. Predicted long-term impacts due to COVID-19 include the increased use of ICT; however, some children and young people see no changes, and thus they experience a shift of going back to normal. Challenges in ICT use in distance learning phases include problems of connectivity and inequalities between children and young people, e.g. regarding treatment and rights. The majority of children and young people express the wish for more ICT use in the school setting, while some wish for less ICT use in school. Further, the children and young people stated a wish for improving the teachers' digital skills.

5.2. Narrative reports on the children and young people's data

As part of work package 5's research on how children and young people regard their education in terms of preparing them for future life in the digital age, children and young people were followed through their educational transition phase. They were interviewed both before their transition and after it. These two perspectives from the same child or young person are included and presented in the narrative reports. Six cases have been selected in each country, according to the sampling criteria, to provide the best diversity level and to provide variety in the narrative reports within and between countries.

The 30 narrative reports are presented below. They are sorted and numbered by country: Estonia, cases 1-6 (**Section 5.2.1**); Germany, cases 7-12 (**Section 5.2.2**); Greece, cases 13-18 (**Section 5.2.3**); Norway, cases 19-24 (**Section 5.2.4**); and Romania, cases 25-30 (**Section 5.2.5**). All narrative reports share a common structure deriving from the main research question of how children and young people regard their education in terms of preparing them for life in the digital age. They are comprised of (a) a brief case description and (b) conclusions of key findings, particularly characterising the case considering the educational transition into the secondary level. Assessing children and young people's ICT experiences in schools and paying particular attention to transition phases into the secondary level entail following a group of children and young people over a longer period and collecting narratives of their ICT experiences, and in this study, with children and young people as co-designers and co-producers of these narratives.

5.2.1. Estonia

In Estonia, the transition phase in education occurs at the end of 9th grade as this marks the end of the compulsory educational level. Young people can continue their studies in gymnasium[3] (10th-12th grade) in vocational schools where, in addition to helping them acquire a profession, general education of 10th-12th grades is also provided. There are different types of schools: (1) schools that provide education up to 9th grade, (2) schools that provide education up to 12th grade, (3) schools that provide education only from 10th-12th grade, or (4) vocational schools. Due to the structure of the educational system in Estonia and the country's scattered population, it is rather common that children and young people change their school during this transition phase. The cases described below were chosen as they represent all possible transition paths. In addition, the selected cases also represent young people from both rural and urban areas, as well as from small, medium and large schools. The sample also considered the young people's personal interests in ICT, as some were more interested in IT compared to others. In addition, as the Russian-speaking community is noticeable in Estonia, one case is chosen where Russian is spoken at home.

To participate in the study, the parent of the participating young person had to sign an informed consent sheet. The young person signed a separate informed consent sheet with more child-friendly language. The Ethics Committee of Tallinn University approved both informed consent sheets beforehand, and provided all the necessary information regarding the DigiGen study and the participants' rights in the context of the interview.

5.2.1.1. Estonia – Case 1 (MS_EE_CYP_01)

a) Brief case description considering the participant's background

Case 1 describes a boy, aged 15 during the first interview, attending the 9th grade. By the time of the second interview, he was attending 10th grade and was 16 years old. He lives in one of the wealthiest local municipalities in Estonia, right next to the capital, Tallinn, and comes from a higher socioeconomic background. He attended 9th grade at a local school close to his home, and changed schools for the 10th grade as the local school only went up to 9th grade. Unfortunately, he was not accepted to the school of his first preference near his home, which led him to registering at another school, located in Tallinn. He spends quite a lot of time on the computer – playing computer games, chatting with friends and scrolling through social media, especially Twitter. At home, he considers himself the most competent when it comes to computers and ICT. In his free time, he has learned to build computers using YouTube videos, reflecting his interest in ICT, in general.

b) Conclusion of key findings characterising this case and considering the transition phase

As seen from the interviews, in 10th grade (after transition), ICT is used in a more diverse way. In 9th grade, computers were mainly used in school to look for information. At home, on the other hand, computers and phones are used to interact with classmates, forward teachers the homework and work on the given assignments, sometimes together with classmates. Case 1 prefers to write essays and more important tests on the computer and always ask teachers whether it is okay to do so. In 9th grade, case 1 elaborates, "In our school, the use of computers isn't so common, or how to say it" – it was done rather rarely, around once a week. After the transition, he describes, "Well, surely they are used more often, that is most noticeable," while later adding, "Once a week, that is more often than was in the previous school." No noticeable difference between teachers' digital competences in 9th and 10th grades was reported. In both cases, teachers' digital skills are considered good as teachers manage their own use of ICT, yet in situations when problems emerge outside of the teachers' ordinary use of ICT, no help should be expected. Considering differences between teachers, in 9th grade, the biggest difference was in age; compared to older teachers, younger teachers tended to know more about how to use computers and different ICT. In 10th grade, no difference was reported between the teachers.

Case 1 described himself as skilful and very confident when working with computers. For him, it is more comfortable to learn with ICT, while also more interesting. He enjoys scrolling through Instagram or playing with his phone during the classes, as in, when he does not have to listen

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3   A 'gymnasium' in Estonia is a secondary school that prepares children and young people for higher education at a university.

to the teacher the whole time. Using ICT has taught him to use different sites and to look for information online from the right sources. Regarding most disliked aspects of ICT and the dangers of it, difficulties maintaining one's focus and concentration emerged several times. As a risk, he has had experience downloading trash, but by now, he knows how to avoid that or even if it happens, he knows how to deal with it.

Regarding digital responsibility, case 1 is well aware of all the aspects of online privacy, consent on uploading photos, etc. Several times, he mentions that these are the topics belonging to younger grades and therefore have already been discussed thoroughly in previous years. In his actions, on the other hand, this knowledge is not used as he and his friends have different practices (e.g. sharing funny photos of each other). In regard to cyber-bullying, case 1 does not consider it as big of a problem as is shown in the media and elsewhere as it all depends on how the person being bullied is able to handle the situation. Interestingly, case 1 reflects that he does not know how to differentiate between fake news and real news and so far, in his life, he has not seen any fake news in the media.

One of the changes he perceived in terms of ICT use after transition (compared to 9th grade) was the diversity of use of ICT in teaching and learning, although he concludes that there is no significant change in the use of ICT between the two schools.

5.2.1.2. Estonia – Case 2 (MS_EE_CYP_02)

a) Brief case description considering the participant's background

Case 2 describes a girl, aged 15 during the first interview, while attending 9th grade. By the time of the second interview, she was attending 10th grade and was 16. Case 2 lives in the capital, Tallinn, and is from a middle socioeconomic background. During the transition to gymnasium, she changed schools and started 10th grade at a well-known school across Estonia. She is generally a very active young person, plays volleyball, participates in a debate club and has recently become a tutor to one child or young person. She is an average user of ICT as she does not have any special interest in computers, although she does evaluate her skills as being higher than that of the average person.

b) Conclusion of key findings characterising this case and considering the transition phase

One of the key findings is that, in 10th grade at her new school, ICT use by teachers has significantly increased as well as diversified. In 9th grade, teachers mainly used ICT to either watch videos or do tests on computers. This was done approximately once a week, maybe even less. Also, the digital competences of teachers in 9th grade varied and, interestingly, it surprises children and young people that some teachers are very good at using ICT. She considers her ICT skills to be better than her teachers in 9th grade. She also mentions that some of the older teachers' ICT skills are not good as some of them protested against distance learning and online classes.

In comparison, at her new school, ICT is used from three days to almost every day a week. All of the teachers seem to manage well with the ICT use, which is reflected in the more diverse ways ICT is used. In some cases, teachers use applications, where children and young people have to start their own company and manage it within an economy. In 10th grade, ICT is used more during the lessons as a way to learn instead of doing tests. While teachers have taught the young people new applications and software environments, there are also IT classes where more applications and tools (e.g. word processing software) are taught. Compared to 9th grade, her new school supports her use of ICT for school-related purposes more visibly, either in the IT classes or as was said by her, "They usually explain everything" and in cases of need, one can easily turn to the teacher.

Regarding the benefits of ICT, Case 2 stresses the comfort it can bring. Working in Google Docs is convenient for group work, writing and forwarding essays with just a link instead of taking photo of it, or handing it in at school. In addition, the learning management system, eSchool, is described as convenient as it has all the grades, assignments and everything in one place, including the possibility to add a checkmark to already completed assignments. One of the benefits is also that ICT is interesting and useful – an example was given with Teams. Most importantly, as she pointed out, "I save time, which is very important, because we have very little of it …" Turning to risks arising from ICT use, viruses are something that came to her mind.

More importantly, she brought up hurting one's eyes several times. She also felt that a stress that ICT can cause is when something does not work or it takes time to log in somewhere, "then it is always stress, because … because you have to be on time."

Reflecting on the transition phase, the interviews illustrate well that, at her new school, the potential of ICT is used more and for different purposes compared to her previous school. As Case 2 describes, "In 9th grade, like, it was rarer and if it was [being used], it was for tests more. But now it is more for learning in the class."

5.2.1.3. Estonia – Case 3 (MS_EE_CYP_03)

a) Brief case description considering the participant's background

Case 3 describes a girl, aged 15 during the first interview, while attending 9th grade. By the time of the second interview, she was attending 10th grade and was 16. Case 3 lives in a small village in northern Estonia and her socioeconomic background is rather low. After transition, she continued going to the same school. Therefore, not much has changed for her, as she pointed out. Outside of school, she is actively involved in different activities. She plays the violin and piano, and goes to skiing practice and dancing camps. She evaluates her skills as quite high (8-9 points out of 10) when it comes to being acquainted with ICT. In her everyday life, she uses ICT mainly for social media (TikTok) and chatting with friends. In general, she is not very interested in ICT and does not see a need for even more use of it in school. When asked if she would like to use ICT more after transition, she replied, "No, I don't bother." Therefore, Case 3 can be considered a moderate user of ICT.

b) Conclusion of key findings characterising this case and considering the transition phase

In general, her ICT use in relation to school and learning has not changed a lot with the transition. As she continued to go to the same school, most parts of her education have remained the same. The school has a computer class, laptops and tablets for children and young people, and sometimes children and young people use their own phones (when some other class is using the tablets). At home, she shares a computer with her sister and, as she says, "I don't bother to start the computer," and therefore she uses her phone a lot.

At school, teachers use Kahoot, Loquiz and other applications for teaching. In some subjects, computers are used to look for information or prepare a presentation. There are some subjects that are more reliable in their use of computers (e.g. Basics of Research or computer classes in basic school); besides that, maths, English, Estonian language, biology and history seem to use ICT. It is mostly used for English, though (here, 'mostly' means twice a week). The change in ICT use in 10th grade has been in the increase of the use of Kahoot, and also having Basics of Research as a subject that uses the computer.

Case 3 sees the main benefits of ICT as having a lot of help with different answers needed for school presentations, home assignments, etc. She finds it a lot easier to be able to search correct words online instead of an orthography dictionary as you can get the answer much faster. In the case of maths, the solutions found online are sometimes easier than the ones shown by the teacher, which make studying easier for her. Also, being able to use ICT during class makes class more fun, especially when devices that are not used so often are handed to children and young people (tablets, in this case). She also points out that, while school bags are very heavy, computers could solve this problem easily by replacing the textbooks. Interestingly, she did not bring up any ICT benefits in regard to content creation (e.g. writing essays on the computer), which aligns with her preference to study with textbooks as she can be sure that textbooks provide the correct answers as opposed to the possibility of coming across edited information online.

On the other side, ICT, especially the Internet, brings her motivation down by distracting her a lot. She illustrates this by saying, "It happens often that a *bling* comes to your phone and you are there 'Oh, let's have a look what is there,'" and the time goes by watching YouTube videos or scrolling through TikTok. Also, the Internet offers a lot of 'places' that could drag you off track, so-to-speak. Case 3 adds that she does not like that "false information has been leaked to the Internet and then you fall for it." During distance learning, she was exposed to too much screen

time, affecting her physical well-being. In regard to digital responsibility, she is well-aware of privacy protection, copyright, etc, yet these rules are not followed all the time.

On the role of ICT as it regards transition, she points out that, as English classes now have more complicated texts in use, she uses more ICT to translate unknown words, reflecting that there was no need for that in 9th grade.

5.2.1.4. Estonia – Case 4 (MS_EE_CYP_04)

a) Brief case description considering the participant's background

Case 4 describes a 15-year-old boy who changed schools after graduating 9th grade. Although he did not manage to get into a school he wanted, he is now studying to become a visual media specialist at a vocational school that also provides general education on that curriculum. He adds that it was the only school where he was accepted. He is from Tallinn and his socioeconomic background status is in the middle. In his free time, he enjoys basketball, MMA (mixed martial arts), art and painting. He does not use a lot of ICT in his free time, mainly using it for listening to music or podcasts when walking to school as he says, "I am not that big of a fan" and he prefers to spend his free time with his friends outside. He considers himself quite a good user, adding that he and his classmates "know more than teachers" when it comes to the use of ICT in 9th grade (before transition). At home, he has a desktop computer and a phone to use, although the former is used the most. Between the interviews, he also received a tablet he uses for drawing.

b) Conclusion of key findings characterising this case and considering the transition phase

With Case 4, one of the main findings is noticeably the increased use of computers in 10th grade. This is understandably related to his interests, as graphic design and front-end programming are some of the subjects he is taking. More than half of the classrooms in his new school are computer classes in which Apple computers are used. At his previous school, only laptops and personal phones were used and that use was rather chaotic, as he points out, "Maybe two weeks, where we don't do anything and then there's one week, where you need [ICT] every day." In 9th grade, they did not use digital tools; rather, paper and textbooks were preferred. Although he wished to be able to use more computers at his previous school, during the after transition interview, he concluded that the use of ICT in 9th grade was enough – subjects taught there did not need ICT use so much. In 9th grade, there were teachers both using ICT and not using ICT; however, in 10th grade, everyone was using ICT – the difference was only the frequency and what was done with the device. While, understandably, vocational subjects use computers for writing programs, creating webpages and so forth, general subjects, such as maths or geography, still use ICT, for example, for presentations, showing children and young people videos or asking them to use their phones to look up something.

Using ICT makes things easier and more convenient. This also works in a motivational way; knowing that learning can be done more easily with ICT (Googling something, things are faster with ICT, etc.), he is willing to do it for a longer time. In comparison, without ICT, some things would take up more time, which would lower his motivation to learn. He also benefits from ICT in a very practical way – when too far from the board, he snaps a photo with his phone and zooms in on the photo to see what is written on the board. Interestingly, doing PowerPoint presentations and trying to make them as interesting as possible has helped him to deal with his stage fright. He also enjoys that, with ICT, he can start working on a project in school and still be able to continue to work on the project at home from a different device. He does not reflect much on the harmful aspects of ICT use. As more on this topic was discussed in the classes before 9th grade, he now believes that everyone is already well aware of the dangers or risks online (e.g. frauds or not talking to strangers). Interestingly, he does not bring up any stressors or (mental) health issues related to using ICT. Unfortunately, using Apple computers is challenging for him as he is used to working with a different operating system. In addition, he is currently struggling with front-end programming, which is difficult for both him and his classmates. In 9th grade, he did not enjoy when the teachers used too many different programs (e.g. during distance learning).

Comparing ICT use between 9th and 10th grade, he says that, in the latter, "We use a lot more computers, a lot-lot more computers" and, "It is a lot more use of digital."

5.2.1.5. Estonia – Case 5 (MS_EE_CYP_05)

a) Brief case description considering the participant's background

Case 5 describes a 16-year-old boy who, after graduating 9th grade, transferred to a new school. His new school is a vocational school, yet in his case, it also provides gymnasium-level education (from 10th to 12th grade). When finished, this will provide him with both general education as well as education on programming and IT. He lives in Tallinn and his first language is not Estonian, but Russian. Based on interviews, it is impossible to say whether immigration background[4] applies. He was born and raised in Estonia. His socioeconomic level can be considered middle class, although speaking Russian puts him, based on statistics, in a more disadvantaged position. In his free time, he enjoys playing guitar and football and, in the future, he hopes to become a programmer. He mostly considers himself a good user of ICT; he only feels discomfort when working with new programs or with new devices.

b) Conclusion of key findings characterising this case and considering the transition phase

In general, Case 5 illustrates a clear shift from practically no ICT use in 9th grade to learning programming and using computers in 10th grade. In 9th grade, even phones were rarely used and he added, "In school, we practically don't use devices, only sometimes to rest, we do Kahoot and sometimes it is allowed to look for information from phones." He took computer classes in 3rd grade and they have not used computers in school since then. He sees his 9th grade teachers as not being competent in ICT use as distance learning brought out a lot of problems and some of the teachers are old. At home, he uses ICT to communicate with classmates and teachers, and to check for homework and schedules on the learning management program. In some cases, the computer is used to look up a word, look for more information or to translate some words.

On another note, in 10th grade, computers and phones are used in lessons. This is understandably connected with learning to become a programmer. In addition, in 10th grade, teachers are very helpful and support children and young people's ICT use, which was not the case in 9th grade. In 9th grade, answering questions on whether teachers support ICT use for school-related purposes, he answered, "Practically no. Even our class teacher hasn't explained about it." His teachers in 10th grade are younger and know their way around digital devices better. The use of ICT is also more diverse, from looking for information to creating something on the computer.

In regards to harmful effects of ICT use, he has not experienced any, although some of his classmates had trouble attending online classes during distance learning. This was explained as the classmates needing to see their teachers "in real life." In addition, for some people, he said that ICT use might "create a little laziness," referring also to ICT offering too much entertainment. When turning to the dangers of ICT, once again, he has not experienced any of them on his own, although through his friends, he knows not to talk with strangers, share too much information online, etc. The same applies to digital responsibility. In his 10th grade year, the teachers have only discussed the need to change your passwords from time to time and to make them more complicated. At the same time, he knows all the aspects of copyrights, online identity (behaviour), etc.

He considers some beneficial aspects of ICT use to include easy access to information (timetable, classes, etc.) and communication with friends. During distance learning, he enjoyed staying home and taking online classes, as it saved him a lot of time since he was not travelling to school and back. He added, "I like the comfort in using ICT. That you have time and you can do it anywhere and you don't have to worry about your handwriting."

For Case 5, the transition to the new school and educational level has brought on more use of ICT devices in classes and he seems to enjoy it. He reflects on the importance of ICT, in general, saying, "Definitely [it is] important. Digital technology helps us to develop, get information, it helps us both at work and in studying."

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4   Based on definition, immigrants are the first three generations from the immobilised person.

5.2.1.6. Estonia – Case 6 (MS_EE_CYP_08)

a) Brief case description considering the participant's background

Case 6 is a 16-year-old girl who used to go to a small kindergarten-school that combines both kindergarten and the compulsory school education up to 9th grade. After transition, she started to go to another, much bigger school – while in 9th grade, she had 10 classmates, and in 10th grade, it is around 30. In her free time, she learns singing and enjoys walking in nature with her dog. She is from the mid-west region of Estonia and her socioeconomic status can be considered middle class. She considers herself a very good user of ICT when it comes to phones, and a rather okay user with computers. Still, when compared to her teachers, she believes that, in some cases, her skills are better when it comes to ICT use. At home, she uses a computer and a phone for school-related assignments. She does not enjoy spending too much time on the computer, as her distance learning experience revealed, although she uses social media on a daily basis (TikTok, Instagram, Facebook) and ICT, in general, to chat with friends. She makes this clear by saying, "Well, I have to mention right away, that I use a lot [of ICT]."

b) Conclusion of key findings characterising this case and considering the transition phase

One of the main findings is that her new school has more computers compared to 9th grade and they are used more often. In 9th grade, desktop computers and tablets were available, although tablets could only be used by one class at a time. In 10th grade, there is a computer class with desktop computers and laptops in every class. In 9th grade, the main device (but not only one) used was her phone, whether for chatting with friends during the breaks between classes or, if the teacher allowed, to Google something, look for a recipe or do a shopping list. Computer lab was used a few times in a month. In 10th grade, the main device used is a computer to look for information, do tests online and create presentations and documents. When compared, in 9th grade, considering all the devices together (computers, tablets, phone), ICT was used around a few times a week. In 10th grade, computers alone are used a few times a week. At home, she mainly uses ICT for Google Translate, to look something up in dictionaries or to Google something. Not so often, yet still, ICT is used at home to finish up presentations and documents needed for school assignments.

Information and communication technology support her learning as the Internet helps her find out more information if something is unclear. This is also important for her motivation when learning. She also mentions that the teachers use Kahoot (both in 9th and 10th grades), and that it offers nice breaks from learning. For her, the main benefit of ICT comes out in her language classes (for translation). She also appreciates the fact that her math teacher in 10th grade uploads all the lesson assignments with answers to Stuudium – a learning management system – for those absent from the class. She does not like to have to stay on the computer for a longer time as it affects her eyes, and she prefers to work with the textbook only to read calmly. She adds that sometimes the devices crash and her Internet connection is not stable at home, thereby prohibiting her access to the assignments or to uploading them. Also, there are only a few materials in Estonian available online.

Regarding her teachers before and after transition, teachers in the 9th grade asked for help from children and young people more than teachers in 10th grade. During the interview, she reflects on how her 9th grade teachers used the chalkboard and notebook more than the teachers in 10th grade. She explains that her teachers' competences are connected to their age, at least in 9th grade. However, after distance learning, it was clear that even those teachers who are not so familiar with ICT had started using it better. At her old school, there was also a phone ban in some areas of the school. She thought this was because the teachers felt that the children and young people spent too much time with digital devices. Her new school does not have restrictions on where, physically in the school, ICT devices can or cannot be used.

In 9th grade, she wanted more devices in school and no phone ban. In 10th grade, she wanted to be able to use Google Translate during language classes, but also to have the opportunity to learn more about digital skills, in general (e.g. an optional course).

5.2.2. Germany

The six selected cases from Germany were comprised of interviews with children and young people that were diverse in terms of gender, socioeconomic status, migratory background and place they lived (see Table 2). In Germany, the individual federal states are responsible for education policy, and thus differences might emerge within Germany, also referring to transition phases into the secondary school level. Fourteen out of 16 federal states in Germany have transition phases from primary school to secondary after four years of school (usually starting at the age of 6 years), while only in two states – Berlin and Brandenburg – do children transition after the fifth grade. Transitioning into secondary level in Germany means transitioning into a new school. At the secondary level, there are different school tracks in Germany, of which the most common types are: secondary general school for grades 5 through 9 or 10 (hauptschule), more practical secondary school for grades 5 through 10 (realschule), a more academic secondary school for grades 5 through 12 or 13 (gymnasium) and a comprehensive school for grades 5 through 12 or 13 (gesamtschule). Children who participated in research in Germany transitioned after grade 4 into different school tracks and thus are aged between 10 and 11 years old.

5.2.2.1. Germany – Case 7 (MS_GE_CYP_03)

a) Brief case description considering the participant's background

The following case description is on case 7, both before the transition and after the transition to academic secondary school for grades 5 through 12 or 13. Case 7 is a 10-year-old girl living in a medium-sized industrial city in Germany, and her socioeconomic status can be considered lower class. Both of case 7's parents were born in Germany and German is spoken at home and with friends.

b) Conclusion of key findings characterising this case and considering the transition phase

Before the transition, it is clear that digital media had already found its way into the classroom. Case 7's primary school is reported to be well-equipped with two computers per classroom, an additional computer room, up to four laptops per class and one smartboard each. It is also noticeable that, mainly due to the pandemic, video conferencing has already been practised and used in primary school. In the interview after the school transition, case 7 reports that the equipment at the new school is not as good. Case 7 says that digital media, such as a TV that can be connected to a tablet, is available in the school, but the focus is more on the media library, which only has four computers. There is only one tablet class at the secondary school and learning apps such as Antolin or Math Pirate, which case 7 used in primary school, are not used with the fifth graders. The general use of apps is only mentioned for the older children and young people. However, since case 7 has already learned how to use learning apps, such as Antolin, fostering reading competence and reading motivation, and Duolingo, a language learning app using game-like elements to motivate users to continue learning, she continues to practise with these learning apps in her free time and also enjoys them. At both primary and secondary schools, there is also a great deal of communication with parents about collaboration platforms, and at the secondary school, parent-teacher conferences are even held through these platforms. It is clear that case 7 uses digital media outside of school, mainly for research purposes for school projects. This applies to both primary school and secondary school, and is also stated as one of the greatest advantages of digital media for school purposes. As a challenge in schools, case 7 names, above all, technical problems that occurred from time to time in her primary school. As far as can be seen from the interview, the children in primary school are neither informed about nor sensitised to the dangers and risks on the Internet and when dealing with digital media. This is different at the secondary school, in that certain mentors talk to the children and young people about topics such as cyberbullying. Furthermore, case 7 already recognises in fifth grade that digital media will become increasingly important in everyday life and understands that it might also be important in future professions. She already recognised this in primary school. In addition, as a fifth grader, she already knows a few things about how to be careful with data and the privacy of others, whereas in primary school, she looked at random websites using search engines without a critical eye. This changed in fifth grade, however, as she expresses that she is

sometimes afraid that she could download a virus on her mobile phone. Differences regarding the competences of the teachers are perceived in both the primary school and the secondary school, and are mainly related to the teachers' ages.

To summarise, the primary school is not only much better equipped with digital media than the grammar school, but also the teachers integrate digital media and various apps much more into their lessons. Case 7 expresses the wish that the secondary school would be better equipped and that she could work more with digital media in the future.

5.2.2.2. Germany – Case 8 (MS_GE_CYP_05)

a) Brief case description considering the participant's background

Case 8 is a boy and his case description includes his experiences both before the school transition and after the transition to lower secondary school. After primary school, case 8 transferred to an academic secondary school for grades 5 through 12 or 13. Case 8 was born and lives in a large industrial city in Germany, and his socioeconomic status can be considered middle class.

b) Conclusion of key findings characterising this case and considering the transition phase

Case 8 states that digital media did not play a big role in his primary school experience. Digital devices, such as six to seven tablets per classroom and Whiteboards (smart boards), were available; however, these could often not be used because they did not work. This changed in secondary school where computers and Whiteboards are used, but again, case 8 mentions that digital media has not yet played a major role in teaching and learning in fifth grade. In primary school, learning apps like Anton were used rarely, and at secondary school, the fifth graders only use a special homepage for school, described as a platform in which you can create a single or multiple walls. Both in primary school and after the transition, case 8 has mainly worked with a tablet at home, but dreams of having a gaming computer. In primary school, digital media are mainly used for research purposes, predominantly in German and science lessons. Outside of school, digital media are also used in primary school to communicate with teachers, while they are mainly used for research purposes at the secondary school. It is striking that the primary school already prepares children and young people for the dangers of using digital media and the Internet whereas the secondary school has not yet addressed these topics. As an expert on risks and dangers while using the Internet, case 8's parent was invited to the school to give a three-hour lecture on Internet safety. The second interview also reveals that case 8 particularly enjoys working with digital media for research purposes at the secondary school. This was quite different in primary school as he did not express much interest in digital media at the time; he preferred books and did not like research work at all. At the secondary school, case 8 reports he finds it annoying that the Internet provides a lot of content and that it always takes time to find what he is looking for. In the fifth grade, case 8 already recognises the importance of digital media for everyday life and often uses messenger apps and ICT for online communication. He also recognises the enormous importance of digital media for his career ambitions, which shifts between orthopaedist and architect, professions where computers are used. Since he is not interested in publishing content on social media, even at secondary school, he does not yet reflect critically on this in relation to posting information. From the interview after the transition, it is clear that case 8 has taught himself some things about dealing with digital media, such as researching, and has learned some things from his father.

While his curiosity for digital media was still rather low in primary school, his interest has increased after the transition; however, he mentions that, regarding the pandemic situation, he finds exclusive work with digital media boring and lonely and would miss his friends. In the interview after the transition, case 8 mentions that his teachers are all very good at working with digital media and are all equipped with a tablet. Furthermore, the school offers computer training for new students to help prepare them for using them. During the lockdown, the primary school worked more with the online platform to create single or multiple walls where materials were also uploaded. Both parents supported case 8 with digital (distance) learning from home. Both interviewees mention that working during the lockdown was not easy and that working at school was greatly missed.

At primary school, he wished that the learning programs would offer reward systems in the future and that downloading video games would be allowed in class. At the secondary school, on the other hand, he expressed the desire for fast-working computers in school and e-sports lessons as well as computer science lessons.

5.2.2.3. Germany – Case 9 (MS_GE_CYP_06)

a) Brief case description considering the participant's background

Case 9 is a boy before and after his transition to an academic secondary school for grades 5 through 12 or 13. He was born and is living in a large city in Germany and has a migratory background with one parent born in another country. At the time of the interviews, he transitioned from primary school to a secondary school, and was 9 years old in the first interview and turned 10 before the second interview.

b) Conclusion of key findings characterising this case and considering the transition phase

Case 9 reported that access to digital devices was limited when attending both primary and secondary school. The changes in secondary school only amount to having a new school subject of computer science and the associated regular use of school computers. In addition, there is an increased use of digital media by teachers. However, the expected use of smartphones and tablets as support did not occur in fifth grade. It was also mentioned that the option to use tablets will not occur until the seventh grade. Nonetheless, case 9's rather negative attitude towards ICT continues to persist in secondary school. Case 9 also illustrates, among other things, the growth of new communication options or communication platforms, such as email programs and collaborative platforms at the secondary school. However, some challenges arise here as well, such as problems with Internet access and with the use of programs at school. Despite expressed uncertainty about the transition in the first interview, case 9 rates the transition as good in the second interview, but states that it could have been better.

Neither the primary school nor the secondary school seem particularly well-equipped with digital media. In the interview after the school transition, it appears that access to digital devices is limited to Whiteboards and school computers. In primary school, geobrowsers, social media and software graphics programs for drawing are used from time to time. The children and young people are allowed to use social media and software graphics programs for drawing after successfully completing tasks.

At home, case 9 has had access to a smartphone, laptops and game consoles before and after transition. Furthermore, he mainly uses games or messengers or collaborative platforms from home, but also a programming system which he has been using at home since the fifth grade. The collaborative platform is mainly used at secondary school as an exchange platform for homework and solutions. The ICT is also used at the secondary school for research purposes. At home, ICT is mainly used to communicate with teachers, but also for communication between parents and teachers. In addition, when he was in primary school, case 9 sometimes used ICT at home for research purposes when working on difficult tasks. Case 9 mentions technical and Internet-related problems and difficulties logging on to certain programs when working with ICT at the secondary school. Case 9 is aware of some dangers, such as viruses that can be downloaded from the Internet if one is not careful, since it was a topic in class.

He does not like using ICT in the context of school education at primary school, says that he does not need Whiteboards and smart boards and that working with smartphones or other digital devices in class does not motivate or excite him. At the secondary school, he expressed that he does not like to work on tablets because he cannot write well on them, and he gets headaches after working on a tablet for a long time. Overall, he has expressed a rather negative attitude towards using ICT for school education, and prefers more analogue media, both in primary school and secondary school.

In terms of career aspirations, he wishes for his dream job to also be as free as possible from ICT as he only uses them for games and does not want to use them for work as well. This statement applies to both before and after the school transition. Already in fifth grade, case 9 is aware of possible consequences of published content and he also knows quite a bit about fake news as his parents have already explained this to him. In general, case 9 feels very safe and competent when it comes to using ICT. Before the school transition, he expected to work with smartphones or tablets at secondary school. In this regard, he mentions that, in lower secondary school, he would like to get a tablet to help him in fifth grade as lessons are getting more and more difficult.

A key difference reported after the school transition is that computer science has been added as a new school subject. Case 9 rates the teachers' competences in working with ICT as very good, and further states that digital media are mainly used in computer science lessons, but also by other teachers, which was not the case in primary school. At primary school, there were no differences in digital media competences between the teachers, whereas the use of ICT at the secondary school seems to be subject-dependent. However, there seems to be little to no support from teachers in using ICT, both before and after the school transition. During the pandemic, there were changes at primary school and many children and young people were dependent on the teachers' support. Despite the negative attitudes shown with regard to using ICT in schools, at the secondary school, case 9 mentions he would like to have better Internet at school, more videos to watch, more games to play and digitalised books on tablets. These wishes could indicate that case 9 has a less negative attitude toward digital media at school since the school transition occurred.

5.2.2.4. Germany – Case 10 (MS_GE_CYP_07)

a) Brief case description considering the participant's background

The following case description is about the child of case 10, both before the school transition and after the transition to an academic secondary school for grades 5 through 12 or 13. Case 10 is a girl with a migratory background, considered to have a high socioeconomic status, who has transferred from primary school to a secondary school. She was born and is living in a rural area in a mid-sized city.

b) Conclusion of key findings characterising this case and considering the transition phase

According to case 10, both her primary and secondary schools have broad access to ICT. In terms of apps, software, programs, etc., there are even more opportunities provided for the children in secondary school. At home, in addition to the use of a tablet while in school, a smartphone is available to case 10 to use for class group communication at the new school. Technical difficulties also occur at both schools. Furthermore, case 10 still has career aspirations for which she considers the use of ICT to be important since as an architect, you might also draw houses digitally while as a medical doctor, you would probably not need that much ICT except for writing things down. Before transitioning to secondary school, case 10 expected an increased use of tablets at the new school. However, this assumption cannot be confirmed because, according to case 10, less digital work is done at the secondary school than at the primary school. In addition, there is little to no exchange with the teachers compared to the primary school. In this regard, case 10 expresses the desire to work more with ICT in both schools.

Both of case 10's primary and secondary schools are digitally well-equipped. The primary school has computers, tablets and whiteboards and smart boards. The secondary school also has computers in a media library and tablets that can be borrowed for lessons. The primary school uses learning apps such as Anton and a learning management system. The same learning management system is used at the secondary school, as well as Scratch, which is used for programming games in computer science lessons. While in primary school, case 10 had her own tablet at home, which is also being used for secondary school at home. She mainly worked with the learning management system and video conference tools for primary school at home, and for secondary school, she works with apps to practise vocabulary at home. At school, ICT is mainly used for research purposes. This applies to both primary school and secondary school.

Outside of school, digital media are mainly used for communicating with teachers and classmates. Apps, such as video conference tools and learning management systems, are mentioned here in particular, but smartphones are also used for communication in a class that uses a group chat feature.

At primary school, case 10 liked working with the tablet, playing games and doing maths exercises online. At secondary school, she reports enjoying programming games and learning vocabulary the most. However, at primary school, it was difficult to write on the tablet at first and she did not like the English lessons in the digital format. At secondary school, she does not like the fact that there are always technical problems.

Advantages that case 10 mentioned include quick research on the Internet and learning vocabulary with apps. Furthermore, case 10 reports that she generally enjoys working with ICT. The disadvantages reported are that, at primary school, not all children have access to ICT, and at secondary school, she says that technical difficulties occur sometimes. Case 10 has not been made aware of possible risks and dangers in working with ICT and the Internet, neither at primary school nor at secondary school. This topic has occasionally been briefly addressed, but there have been no actual lessons or materials in either of the schools so far.

In fourth grade, she recognised the importance of ICT in everyday life, referring to communication using her mobile phone. Furthermore, she recognises the importance of ICT for future career aspirations, such as becoming a doctor or architect. As a fifth grader, after transition, she adds that she would definitely like to have a job later in which she works with ICT a lot. In fifth grade, case 10 already knows some things about publishing/posting information. For example, she says that everything that is uploaded on the Internet stays out there and can also be used against you. In general, she already feels very confident dealing with ICT in primary school and relies on the support of her teachers or parents when she has questions.

Before the transition, it was anticipated that working with ICT would increase at the secondary school. However, her expectations were then let down as there is less work with ICT at the secondary school and the teachers, apart from the computer science teacher, are less supportive of digital work. At primary school, case 10 reported her impression that the teachers liked to work with ICT a lot and often, whereas the teachers at the secondary school hardly integrated ICT into the lessons and primarily used it in computer science lessons. At the primary school, there was even a computer club and tablet lessons where the children got help and were allowed to experiment.

During the pandemic-related distance learning phases, weekly schedules with materials were uploaded to the learning management system at the primary school. Case 10 states that she sometimes found it difficult to understand the tasks provided online during the pandemic. In addition, she missed her friends and the face-to-face lessons very much and reported a feeling of loneliness. At primary school, she wished that learning apps would also allow mistakes so that you did not have to start all over again, and that working with ICT at school would increase. This wish remains while she is at the secondary school as there is only a little work with ICT done there.

5.2.2.5. Germany – Case 11 (MS_GE_CYP_08)

a) Brief case description considering the participant's background

Case 11 describes a 10-year-old girl living in one of Germany's most populated cities in North Rhine-Westphalia (NRW). She transitioned from primary school after grade four to a comprehensive school for grades 5 through 12 or 13 in Germany in the summer of 2021. She has a migratory background, her and her parents being born outside of Germany. She thus, grew up speaking German, but also two more languages for a few years before switching to German only. Coming from a low socioeconomic background, she is supported by a youth welfare service, where she spends a lot of time with educators who take care of her, also in terms of schoolwork.

b) Conclusion of key findings characterising this case and considering the transition phase

Overall, the interviews conducted before and after the transition show that case 11 uses ICT more often at secondary school than at primary school. At her new school, she attends a tablet class, using tablets on a regular basis in almost each subject. At primary school, only a limited set of tablets was available, but were not used that often and also had to be shared with classmates. At secondary school, digital devices, programs and apps are used in a variety of ways and in open work assignments, e.g. for research tasks, to create presentations, to edit and save worksheets, to learn vocabulary and much more, whereas at primary school, it was mainly used for learning apps.

No major differences between the teachers at primary and secondary school were reported in terms of digital skills. She considers them to be digitally competent at both schools. At the lower

secondary school, in comparison to the primary school, the new subject of computer science was introduced when doing work that is always done using digital devices and programs. In addition, there are extra teachers at the new school who show children how to use the tablets and collaborative programs, and help them with any technical problems they may encounter. Overall, both before and after the transition, she feels motivated when working with ICT and enjoys it.

However, during the interview before the transition, case 11 stated that she wished to work with the tablets at her new school more often, but after the transition, she noted that she would sometimes like to work less with the tablet. Her reasoning for this was a desire to be in direct contact with her classmates more and because she found working digitally to hinder her socialisation. Moreover, she suggests that working digitally in school should start in grade six, at the earliest, since there are many other things to pay attention to when transitioning from one school to another.

Further reports on harmful aspects of ICT use have addressed experiences regarding privacy violations as the result of others taking photos without consent. Regarding risks and dangers, case 11 learned about data protection at her primary school, mainly in terms of pictures. The topic was addressed in class and included an extra lesson on social training on the topics of online safety and privacy, fake news and cyberbullying, as well. After the transition, computer science lessons addressed risks, like ensuring that a user has secure passwords. If she is unable to figure out new apps and programs herself, she turns to her teachers for help. Attending grade five, after transition, case 11 describes her digital competences as being average. Nonetheless, her attitude towards getting to know and working with new devices and apps is positive.

As a benefit, higher motivation is reported when it comes to independently researching information using the Internet and, above all, becoming a creator of digital content. Problems with a bad Internet connection at school, as well as technical problems with digital devices outside school, are reported as negative conditions of working with ICT.

Moreover, the information that case 11 provided on digital skills that one might need in their everyday life or to reach one's dream job highlights the need to pay more attention to how children and young people perceive digital aspects and competences as a part of their everyday lives. This also helps to understand which aspects and competences to address and foster at school.

5.2.2.6. Germany – Case 12 (MS_GE_CYP_10)

a) Brief case description considering the participant's background

Case 12 is a young person before and after the transition to secondary general school for grades 5 through 9 or 10. Case 12, having a migratory background, was born and lives in a rural area near one of the largest cities in Germany. His socioeconomic status can be considered middle class. He is generally a very active person in terms of sports and socialising with friends, preferring face-to-face interactions rather than being online.

b) Conclusion of key findings characterising this case and considering the transition phase

At primary school, case 12 had access to only a small number of school tablets and a computer room, while at his secondary school, there is a computer room, many laptops, projectors and a Whiteboard. At the primary school, learning videos were integrated into the lessons. At the secondary school, mainly the programming software, community Scratch and the learning app Anton are used. In primary school, case 12 could access school tablets from home during the distance learning period and also had his own laptop. At home, case 12 worked with the school's online platform, email programs, learning apps and learning videos as tutorials during the primary school period, while after the transition, he mostly only worked with the school's online platform and learning apps at home. In primary school, ICT was used outside school, mainly for communication and information purposes. In the fifth grade, he uses them mainly for communication as well as interaction purposes, such as uploading assignments for teachers, etc.

He mentions several challenges to ICT use in the school context, including technical and Internet problems in primary school, problems with certain apps, and, especially during the pandemic, that some assignments did not get to the children and young people or that it was not possible

to work on them due to technical issues. After transition, he mainly reports having technical and Internet problems, as well as problems with understanding the tasks in fifth grade.

Case 12 mentions that he was only taught about the dangers and risk of using ICT at primary school in the context of a computer club. Among other things, they talked about hackers. However, further education on these topics did not take place at secondary school. At primary school, case 12's favourite aspects were that working with ICT was exciting and a good support for learning. In secondary school, he most likes the fact that using ICT is like leisure time and that the time goes by faster.

The aspects he liked least about digital work in primary school were, having to hand in assignments online and the fact that some learning videos were difficult to understand. After transition, he reports sometimes seeing ICT as a disruptive factor and finds them annoying because he gets headaches after spending a long time in front of screens.

In primary school, ICT already played a central role in case 12's everyday life as he used them for learning as well as for playing. In fifth grade, ICT continues to play an important role in his everyday life as he increasingly uses them for communicating with friends and playing games. It is noticeable that while in primary school, he expressed the wish to do something involving ICT later on in his career, but this is not explained in further detail.

In general, case 12 states that he enjoys using digital media a lot. After the school transition, the use of digital media increased and the subject of computer science was introduced. Nevertheless, some learning apps such as Anton as well as the school's online managing and collaboration platform were already known from primary school and thus, as stated, to some degree facilitated the transition to a new school where some use of ICT was already familiar.

Teachers' digital literacy is rated as only somewhat existent in both primary and secondary schools; however, ICT is used very regularly at secondary school, which was not yet the norm at primary school. In addition, the frequency of the use of ICT also seems to depend on the class subject. Case 12 reports that there was no change in ICT use during the pandemic, but at secondary school, the school's online managing and collaboration platform is used to prepare children for future cases of crisis. At primary school, case 12 would like to have had opportunities to work with ICT during the breaks and regular use of ICT in class.

5.2.3. Greece

In Greece, the transition from primary to lower secondary education occurs after the 6th grade, i.e. when a child is 11–12-years-old. Secondary education is comprised of the three-year lower high school (gymnasium), which is part of the compulsory education, and a three-year upper high school, divided in the General Lyceum leading to universities and the Vocational Lyceum leading to further vocational training. Although the educational system, particularly in its early stages, is common and centralised, significant differences exist between public and private schools. In Greece, in big cities in particular, private education is quite common and is an option for many families that can afford it.

5.2.3.1. Greece – Case 13 (MS_GR_CYP_01)

a) Brief case description considering the participant's background

Case 13 is a boy living in a working-class district of the metropolitan area of Athens. He attended public schools both before and after transition. His parents are both employed, and he has an older sister. His socioeconomic status can be defined as middle class. The interviews were conducted online, one before and one after his transition from primary (6th grade) to secondary (7th grade) education.

b) Conclusion of key findings characterising this case and considering the transition phase

Case 13 seems to be familiar with ICT. He has owned a mobile phone since entering 6th grade and shares a laptop with his sister. He describes the school equipment as being poor, since in primary schools they did not have an ICT classroom, while at high school they have a classroom with desktop computers. Nevertheless, even in high school, ICT is rarely used outside of the ICT class.

At home, the main device he uses for school purposes is his mobile phone. After transition, he began using the shared laptop in order to attend tutorial online classes. He mainly uses Viber to communicate with classmates (communication with teachers is mostly conducted through emails and/or phone calls), YouTube for viewing informative videos and Google for conducting searches. It is interesting that teachers at the high school do not encourage children and young people to use the Internet for educational purposes, but instead encourage using books and dictionaries.

As far as risks and dangers related to ICT are concerned, Case 13 mentioned that, although they had discussions with teachers at primary school, they had not yet had any similar discussion in high school. In general, he does not think that school prepares the children and young people adequately for a future (digital) life. He thinks that there should be more courses about and using ICT because new technologies facilitate work regardless of one's profession or job. He also considers ICT to be very important for communication and facilitation of everyday life.

Although he feels confident in terms of ICT use (the experience of distance learning during the pandemic played an important role in this), he is reluctant and sometimes cautious. He believes that everyone should check the validity of sources and should also be cautious when they use social media, particularly in uploading photos or personal information.

In the first interview, he was curious about ICT use after transition, but in the second interview, he reported that there is less ICT use than expected. His teachers after transition are generally older and less familiar with ICT, and they were not obligated to do distance learning since there were no lockdowns this year. Therefore, help in technology-related issues is mostly provided by classmates instead of teachers.

The experience of the pandemic and distance learning is generally considered negative, mainly because teachers were not well-prepared and obviously did not enjoy this method of teaching. He feels that things went back to 'normal' after the lockdowns, where ICT is not really incorporated in the educational process.

5.2.3.2. Greece – Case 14 (MS_GR_CYP_02)

a) Brief case description considering the participant's background

Case 14 is a girl from Thessaloniki, the second largest city in the country. She has been attending an experimental public school, both in primary and in secondary levels.[5] She has no siblings, and both her parents work in the public sector. Her socioeconomic status could be defined as middle class.

b) Conclusion of key findings characterising this case and considering the transition phase

The fact that this specific case has been attending an experimental school, where teachers have increased formal qualification and the appropriate scientific and pedagogical training and teaching experience so that they are able to implement pilot projects, might alter the findings to a certain extent. To begin with, as regards the access and use of ICT inside school, there seems to be an extended use of hardware and software in several classes, particularly after transition. Applications, such as PowerPoint, were also used at the primary school, while after transition, more applications from the Office suite became part of the classes. Therefore, the young person is familiar with online research for information and is also aware of the potential risks, particularly when she uses social media.

Information and communication technologies are useful for educational purposes, in general, although some applications and programs are not designed adequately for the age group to which they are addressed. These technologies can also serve as a self-educating mechanism

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5   It must be clarified that experimental schools exist in all levels of education (kindergarten, primary, and low and upper high school). In experimental schools, new curricula and timetables, teaching tools, school textbooks and other educational materials, teaching methods, and ways of managing and operating the school unit are tested. The Ministry of Education designed these pilot programmes, following the Institute of Educational Policy's opinion, as well as universities or research centres related to education. The objective of these schools is to provide useful conclusions that can be utilised in designing education policy.

and can assist the young person to learn things that cannot be learned through other means. Despite this, everyone should be cautious about protecting their personal data.

Case 14 found the transition phase to be less difficult and demanding than expected. This had to do with the relatively extended use of ICT before transition. It also had to do with the fact that her teachers, before and after transition, were generally familiar with using ICT in the classroom. Age might be a significant variable here, but her familiarity with ICT helped to overcome any challenges related to ICT use.

The COVID-19 experience is deemed both negative and positive from different perspectives: negative because of practical problems, such as connectivity, less attention and participation in the class, changes in everyday life, lack of mobility, etc., and positive because children became more familiar with ICT due to their increased use.

5.2.3.3. Greece – Case 15 (MS_GR_CYP_03)

a) Brief case description considering the participant's background

Case 15 is a boy living in a medium-sized town in the northeast of the country. He has attended a public school both before and after transition. He has an older brother and his father is a university professor, while his mother is a homemaker. The family's socioeconomic status can be defined as middle class. Particularly to this case is the boy's eagerness for new technologies, that includes self-educating videos on computers and programming.

b) Conclusion of key findings characterising this case and considering the transition phase

Case 15's access and the use of ICT, both at school and at home, can be described as satisfactory. Every class in primary school was equipped with a laptop and a projector, and at high school, there is extensive use of ICT in most classes, including projection of videos, presentations and use of digital maps. He has been using a mobile phone, a desktop and a laptop, and is familiar with applications, such as Office, Google and YouTube among others for preparing his homework.

As far as threats and dangers are concerned, he is aware of them and he reported relevant discussions at high school with parents, teachers and experts who visited their school. However, he feels confident in himself and believes that he is careful enough to avoid potential risks.

He is certain that ICT will play an even more important role in the future – he would like to become a programmer himself – and he thinks that new technologies facilitate people's everyday lives, saving time and space. Nevertheless, he admits that ICT use can be addictive and prevent people, and particularly young people, from fulfilling their tasks and advancing their studies.

He was prepared for the transition, given the fact that he has an older brother who transitioned a couple of years ago. The use of ICT increased after transition; there are, however, differences depending on the teachers' ages and on the subject taught, e.g. in history and geography, ICT use is much easier and makes more sense.

Despite the problems of connectivity and the inequalities among children and young people that appeared during the pandemic and the lockdowns, he considers the experience of distance learning to be a positive one. It gave him the opportunity to become more confident and proficient with ICT. He feels that he has learned many new things that will be extremely helpful in the future.

5.2.3.4. Greece – Case 16 (MS_GR_CYP_04)

a) Brief case description considering the participant's background

Case 16 is a girl living in Athens, attending a public school both before and after transition. She has no siblings, and she lives with her parents who both work: her father is a university professor, while her mother is working in a private company. The family's socioeconomic status

can be defined as middle to upper class. She likes painting and started to learn to play the guitar a year before the first interview. She would like to become an actress, although she has not really given it a lot of thought.

b) Conclusion of key findings characterising this case and considering the transition phase

While the primary school she attended only had computers in the ICT classroom, her high school is relatively well-equipped, though not as well as a private school, according to her statement. She has owned a mobile phone since the age of 11, as well as a tablet and a laptop, and she admits that she uses ICT a lot, for studying, for communicating with friends and for amusing herself with videos on YouTube and TikTok.

The most threatening thing she mentioned are viruses, but she also point to avoiding uploading personal photos on social media because of the dangers this can elicit. She seems familiar with concepts such as copyrights as they have discussed this with teachers at the high school. She feels confident in terms of ICT use, and she tries to verify the information she receives online on several websites, not only on Wikipedia.

She expected the transition to be more difficult, but also more interesting than it has proven to be. They have an increased use of ICT at high school, but she feels that she was already well-prepared to cope with it. She has received help from teachers and parents, but in general, teachers do not seem to enjoy distance learning as much as face-to-face lessons.

Although her school was not very well-prepared and teachers had problems adapting to distance learning at the beginning of the lockdowns, teaching was sometimes more interesting because of the use of ICT and videos. She believes that, due to COVID-19 and distance learning, ICT is used much more at schools after the pandemic.

5.2.3.5. Greece – Case 17 (MS_GR_CYP_05)

a) Brief case description considering the participant's background

Case 17 is a girl living with her parents in a middle-class district of Athens. She has been going to a private school, both before and after transition. Her parents are employed, with her father working in the public sector and her mother working in the private sector. The family's socioeconomic status can be considered to be relatively high/upper class. The respondent is interested in drawing and would like to work as a manga artist, but she feels that it is too early to decide on her future.

b) Conclusion of key findings characterising this case and considering the transition phase

The classrooms in her school, both before and after transition, were equipped with laptops and projectors that the teachers used in order to show videos and visual material during the class. During the lockdown, her school did not use Webex, but Microsoft Teams. She owns a mobile phone, a desktop computer and a laptop, and she uses several applications and platforms, such as Viber, YouTube, Google, Facebook, Tik Tok and Microsoft Office, most frequently referring to Word and PowerPoint for school-related purposes.

She is aware of online threats and dangers because she has discussed them with her parents and teachers. She reported being very careful and not revealing personal data while playing or doing other things on the Internet. She feels that ICT is an indispensable part of people's lives, and in the future, everyone should know the basics, regardless of their job.

She is relatively self-confident in terms of ICT use. She did not feel stressed about her transition to secondary education. She expected more ICT use, and this made some classes more exciting. Her school uses ICT more often than other schools – according to her friends attending public schools – and teachers are more or less familiar with the use of new technologies in their teaching.

During the lockdown the school quickly adapted to the new situation particularly referring to pandemic induced distance learning formats. The time schedule was different than that of public

schools; they had classes from 8:30am to 2pm, which made things easier. This experience likely leads her to think that teachers and schools are and will use ICT much more often now than before the pandemic.

5.2.3.6. Greece – Case 18 (MS_GR_CYP_06)

a) Brief case description considering the participant's background

Case 18 is a boy living in a medium-sized city in the northwest of the country. He was going to a public primary school on the outskirts of the town, which was still under construction. He is also going to a public high school. His parents both work in the private sector and the family's socioeconomic status can be described as low-to-middle class. He has not thought of what he would like to be when he grows up because he thinks it is too early.

b) Conclusion of key findings characterising this case and considering the transition phase

Before transition, his school was not yet fully equipped since it was still under construction; there were only computers in the ICT classroom and several children and young people shared them. In high school, there is a better proportion of desktop computers to children. Nevertheless, ICT use is limited to ICT classes, and it is not used in other subjects. Case 18 uses Office at home and searches on Google to find information that is useful for homework.

He seems to be aware of the risks existing online and therefore does not reveal personal data while playing or communicating on the Internet. He was informed of the dangers and risks related to ICT while in the sixth grade, when experts visited the school and discussed these issues with the children and young people.

He admits that he would like to have more ICT use in his classes, because he thinks that it will be indispensable for everyone in the future, independent of a person's profession. He feels that school does not adequately prepare children and young people for their future life in the digital era. This also has to do with the fact that teachers do not seem to enjoy using ICT, and some of them – particularly the older ones – have significant difficulties in doing so.

He had an interesting criticism regarding the lockdown experience. He clearly distinguished the first lockdown from the second, reporting that in the former, there was no preparation at all. He also reported severe technical problems during the entire period of distance learning, and the fact that this aggravated existing inequalities among children. Finally, he was very critical towards the government and their choice of the Webex platform, because he felt it was the worst possible choice.

Although he mentioned during the first interview that distance learning might be used in the future in extraordinary circumstances and ICT use might be more extensive because teachers will have become more familiar with ICT, in the second interview and having the experience of the post-lockdown condition, he reported that nothing has really changed. Teaching remains within its traditional realm.

5.2.4. Norway

In Norway, researchers interviewed a total of 11 adolescents aged 12-13. All of the participating countries agreed that only six cases would be used in this report. The full data set will be used in other publications (e.g. the final DigiGen book). The six selected cases were chosen in order to provide diversity in terms of the type of school (public vs. private), geographic area (urban vs. rural), gender and immigrant background.[6]

The Norwegian school system can be divided into three parts: elementary school (barneskole, ages 6-13), lower secondary school (ungdomsskole, ages 13–16) and upper secondary school (videregåendeskole, ages 16–19). The transition phase presented in the Norwegian narratives is between primary school (grade 7) to lower secondary school (grade 8). In primary and

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[6]   While all the children were born in Norway, some had parents who were non-ethnic Norwegians and who were born abroad.

lower secondary school, pupils use one national curriculum. The Norwegian Directorate for Education and Training is responsible for supervising the quality of primary and secondary education. Most schools in Norway are municipal, and the running and administration of these schools is a municipal responsibility. Primary and lower secondary education is free of charge and mandatory, and it is based on the principle of equal and adapted education for all in an inclusive, comprehensive school system. The goal is that all children and young people shall acquire certain basic skills; be included in a common knowledge, culture and value base; and experience mastery and challenges at school.

No grades are given at the primary school level; instead, the children and young people receive textual formative assessment. At the lower secondary school, pupils are awarded grades in mandatory subjects around the Christmas holidays and at the end of the school year. On completion of lower secondary school, pupils receive a certificate listing their grades. After completing lower secondary school, they are entitled to three years of upper secondary education.

The narrative reports presented here were chosen in order to give the best possible variety of the informants. The six narrative reports present variation in terms of gender, geographical location (urban, suburban, rural) and in terms of children attending both public and private schools.

5.2.4.1. Norway – Case 19 (MS_ NO_CYP _06)

a) Brief case description considering the participant's background

When researchers first met case 19, she was 12-years-old and attending grade 7 at a private school located in an urban area. She has several hobbies, such as karate and dance, which were difficult to continue doing during the COVID lockdowns, yet were made possible by having online webinars. Her parents both have higher education degrees, and she comes from a typical middle-class family living in an urban area.

b) Conclusion of key findings characterising this case and considering the transition phase

In grade 7, case 19 thought she might want to work in medicine or research in the future. In 8th grade, she is still sure she would like to work in research, but perhaps more related to pharmacology. When asked whether technology will be important for her future career, she said she thought that it would be very important for connecting with colleagues and having access to her own work projects. When researchers spoke with her in the 7th grade, she felt that the COVID-19 experience helped pave the way for more use of technology in school, and that using programs like Teams and Word had increased and continued even more into the 8th grade.

ICT is important to her, and she uses a range of tools for various activities. For reading, she has a Kindle, and for school, she uses her mobile phone, a PC and her tablet. She brings her own laptop to school, but her school has a set of laptops and Macs for those who forget or do not have their own. In her school, there are not many books available, but there is a mix of physical and e-books, depending on the subject. She always uses her laptop at school if she has the opportunity to do so. She writes most of her work in Word and uses Teams at school to get assignments, feedback and "mostly for everything." Before the COVID-19 lockdown, they did not use Teams, but now, it has become an important tool that makes it easier to "have an overview of assignments and schoolwork in general." Her favourite subjects are math and science, and, in both subjects, teachers make use of a range of digital tools like YouTube and Google. The children and young people are also learning to use Office programs, like Word and Excel. Recently, her science teacher had the children and young people s make a podcast. In preparing her podcast, case 19 made use of Disney+ and Netflix to watch nature documentaries.

Since case 19 is attending a private school, she did not change schools and is attending 8th grade with many of the same classmates and most of the same teachers. She feels the tests they are taking now and having to focus on grades is rather different as it is something they did not need to worry about in 7th grade. For her, having to think about, study for and be

graded on tests is "very stressing." She is a hard-working young person who wants to do well, and even attends an after-school math program to help her do her best in one of her favourite subjects. A recent 8th grade assignment focused on how "social media, Google and all that big tech stuff affects us." The aim was to understand how some technology can manipulate people. For her, it was strange to be forced to use social media for 15 minutes when they are usually told to put their phones away. She tells the researchers she used Snapchat as that is the only social media she has apart from Discord, but many of her classmates used Instagram and other things.

5.2.4.2. Norway – Case 20 (MS_NO_CYP_09)

a) Brief case description considering the participant's background

Case 20 describes a 13-year-old boy who lives in a middle-class family with his parents in a small rural town. Both parents have higher education degrees. During his free time, he sings in a choir and plays indoor bandy (floor hockey), but due to COVID-19, he was unable to practice as much as he usually did in 7th grade. He would like to be an architect in the future, and he thinks technology will be very important, especially drawing programs and math programs to help calculate how things should both look and function. While school may not directly help him learn what he needs for his dream job, he still thinks he is learning important things for the future, such as "being critical of sources and stuff like that" and learning to use different digital tools to solve different problems.

b) Conclusion of key findings characterising this case and considering the transition phase

A typical school day for case 20 involves using the PC computer, smartboard (mainly as a projector) and, on occasion, the mobile phones if they have a scavenger hunt and need to find their way around. He also uses Kahoot for quizzes or Q&A sessions. He mentions his school uses 'It's Learning' and OneDrive, which he thinks are great as he can have access to all his work online no matter "if you are at home or at school." He also likes to watch geography documentaries and he thinks it would be fun to watch more science videos in school, for example, on YouTube. He finds YouTube or even Google useful for different things, but he is clear that one must be critical of sources, especially if it is for a school. He points out that using YouTube and Google is good when writing something like a factual text. Both platforms are "useful to find facts, search more places, get more answers, and then you can kind of compare them." He also likes to use communication tools, like Snapchat, with his uncle and friends or Instagram to see what his friends are posting; however, he does not post much himself.

Case 20 has had a smooth transition to grade 8 and has made several new friends, especially since his new school includes children and young people from three different schools. He likes that the school is newer than his previous school and even if the school day is a bit longer, he is happy overall in 8th grade. He likes the feeling of having more responsibility and being able to decide a bit more by himself. At the new school, they have better PCs (new PCs), and he thinks it is good that teachers are more specialised in their subjects. The new school only uses e-books, and he does not have a problem reading on the screen. Having only e-books means that "the books do not get ruined, forgotten at home or lost; they are always available." He feels he is good at English "like most kids [his] age" because they use a lot of English when they are online and sometimes using English to search is easier or provides better results.

5.2.4.3. Norway – Case 21 (MS_NO_CYP_17)

a) Brief case description considering the participant's background

Case 21 is a 12-year-old boy who was attending 7th grade when researchers first met him. He lives in a suburban area and likes to play PlayStation with his friends in his free time. He also likes to be active outside. His parents both have a background of higher education, and the family is a typical middle-class family. In 7th grade, his idea for a future job/profession was to become a firefighter. A TV series on firefighters sparked this desire. When asking him in grade 8 about his future job, he said he is more unsure about his plans. He also thinks there are some limitations in how well school is preparing him for his future work.

b) Conclusion of key findings characterising this case and considering the transition phase

A typical day for case 21 starts with checking his mobile phone before he goes to school. Once there, he uses a PC computer relatively often and software such as Teams, OneNote and Google. He also mentions that he plays Minecraft at school, even when he is not allowed to do so. He would like to use more games to learn different subjects as he finds gaming fun. After school, he comes home and interacts with friends on PlayStation. YouTube is also an important source of information and leisure for him. He thinks it is much more motivating to write on a PC than on paper, and the main advantage is that it goes quicker to write on a PC than by hand and it is easier to change the order of things and edit text. He particularly likes maths and finds it fun to do these assignments online with an adaptive learning program. Case 21 says he is very open to new apps and that he likes to try out new digital things. He mentions challenges with receiving unwanted pictures online, but finds that ICT also make the world more sociable, connected and together.

The transition to grade 8 went well as he already knew all his new classmates. It felt safe and he felt lucky to be placed in the "best" class of the cohort. He explains that, in grade 8, they are supposed to work more independently with school subjects than they did in grade 7. He mentions that, while in grade 7, the class had their own classroom, but they need to move between classrooms quite a lot in grade 8. He also uses the computer more in grade 8 in most classes, whereas his use in school was more sporadic in grade 7. He has also noticed a difference in teachers' digital competence when he compares the beginning of the COVID-19 pandemic to further into the pandemic. Teachers are much more digitally competent now, and he also mentions that he himself uses computers more now. Still, he would really like to get faster PCs to work on in school that need less maintenance.

5.2.4.4. Norway – Case 22 (MS_NO_CYP_19)

a) Brief case description considering the participant's background

Case 22 is a 12-year-old boy who is living with his parents in a suburban area. He has grown up in a bilingual family as his father is Norwegian and his mother is originally from another European country. Both his parents are well-educated and have specialised jobs, and his father is in a leadership position. He is an active boy who likes to do different kinds of sports and is active in winter sports, such as skiing, and summer sports, such as sailing. His future plans are to become a captain on a ship, and he sees technology as a very important part of this career path.

b) Conclusion of key findings characterising this case and considering the transition phase

In case 22's school, they have 1:1 Chromebook coverage and when doing schoolwork, he uses Google Classroom and various applications. He did not notice a great difference in how computers were used before and during COVID-19 as technology use was already incorporated in his school day prior to the pandemic. At home, he uses his mobile phone, watches TV and has a PlayStation with which he plays different kinds of computer games such as Minecraft, Fortnite and Rocket League, even though his gaming activities have reduced in grade 8. He also uses YouTube to learn new things at home. Sometimes, he finds it challenging to stop gaming when he is in the middle of something and he mentions one of his teachers being very concerned about self-regulation and computer use. He agrees that this is important. At school, he finds it motivating to use technology to learn things in various ways and not only sit and write monotonously with pen on paper.

Case 22 was excited to start secondary school and looks forward to getting grades for his schoolwork. When researchers met him after transition, he was very happy and liked the secondary school much better than his primary school. He likes the freedom and the fact that he is allowed to make the decisions regarding his studies. He finds it motivating to get grades for his schoolwork. In primary school, he liked English and physical activity, whereas maths has become his favourite in secondary school. He says he uses much of the same technology in secondary school, although the lessons are quite different. They work more on presenting things in front of the class, and they also do a lot of cooperative writing in online groups. He finds it useful to use technology to search for things and learn new things, but he likes writing

things on paper when doing maths. The technology is also convenient for contacting the teacher if he has questions regarding homework or other school-related things. He has not experienced any problems using the technology in school since he has been doing so since approximately grade 1 or 2.

5.2.4.5. Norway – Case 23 (MS_NO_CYP_12)

a) Brief case description considering the participant's background

Case 23 was born in Norway to two Norwegian parents. She indicated that there are over 200 books in her home. Both of her parents work, with one in a private technology firm and the other in a local county's archival department. She was 13-years-old when the first interview was conducted. She mainly uses her mobile phone and PC computer, TikTok and YouTube, or watches a film in her free time. She does not have any extracurricular activities, but reports that she would like to play volleyball.

b) Conclusion of key findings characterising this case and considering the transition phase

Case 23's favourite subjects at school before transition were history and science. Her school was very close to her home. At school, they mainly used PowerPoint and Word, but they also used other applications such as Minecraft. Case 23 has not really reflected on what she would like to be when she grows up, and still does not know what she wants to be after the school transition. However, she thinks that coding will be important in the future, and says that they have learned to code at school and made "robots move around," which she thought was fun. She talked about how school changed a little with regard to using technology, in that they did not use Teams much before the pandemic, but it is now more in use.

After the transition, case 23 expected more people at school, new classes, new teachers, to make new friends, more homework and more difficult schoolwork; however, it was still a rather small school. She says that the authorities were supposed to build a new secondary school, but now this newly-built school will be used for a primary school.

After the transition to lower secondary school, case 23 was given a used PC, but expects to get a new PC. She also reports using her own private mobile phone during lessons sometimes, as this was "necessary." She did not know before starting secondary school what kind of device she would have. She reports using the same type of Office applications as she did in middle school (Word, PowerPoint), but she now also uses OneNote and Google for researching and a calculator for maths. They do not have paper books in all subjects and she reports the use of different apps at school. She thinks it is sometimes difficult not to have paper books as it is easier to leaf through a paper book rather than a digital app or book. She reports having a digital book for maths, for example.

After the transition, case 23 reported that the new school is better, the school environment is different and they have a different timetable. Science is still her favourite subject as well as social studies and music. When asked why she enjoys these subjects, she said that there is not "so much writing" but they do "different things" (experiments, playing music). A typical day at school starts with subjects that she does not find very interesting, followed by a break, then perhaps more interesting subjects with more variety.

5.2.4.6. Norway – Case 24 (MS_NO_CYP_13)

a) Brief case description considering the participant's background

Case 24 describes a boy who was born in Norway to two Norwegian parents. When asked about, he indicated that there are over 200 books in his home. Both parents work; one is a police officer and one "highly educated." He was 12 at the time of the first interview and 13 at the time of the second interview. He plays football (a keen Tottenham supporter) and piano, and skis in his free time.

b) Conclusion of key findings characterising this case and considering the transition phase

During the lockdown, case 24 felt that the initial tasks given were somewhat easy. Furthermore, they did not have some of the practical subjects, such as "food and nutrition" or "outdoor life,"

due to the COVID-19 situation. In the second home-schooling period, the tasks became more difficult. During the lockdown period, they used Teams and OneNote to communicate with the teachers at school.

Case 24 is not sure what he would like to be when he grows up, but thinks he wants to do something with animals or sports, perhaps becoming a veterinarian or a football player. He reflects that technology would be a good help, for example, to learn about birds. After transition, he mentions potentially doing something with animals, but also football as stated before transition and further also pianist.

At primary school, they had a Smartboard and a PC that they were allowed to take home. At school, they use Word, PowerPoint and Excel in addition to Teams and OneNote. Case 24 also uses Kikora for maths tasks, and YouTube at home. He is not on social media because he is not 13 yet ("two months to go"), but has not really reflected much on using social media.

At school, they have a "technical person" to whom the children and young people can turn for IT help (he says he has received help a couple of times when the PC did not work).

After the transition, case 24 will not change schools (i.e. he goes to a school for grades 1-10). He does not know, before the transition, whether he will get a new PC or keep the one that he has now. With regards to expectations for the transition to secondary school, he thinks that secondary school will be more serious and that, if the children and young people, for example, played games during lessons, they would be given penalty points (there are children and young people who play games in class before transition, but he does not). While they do not get penalty points, he says that they get reported for bad behaviour. He also has more tests than in primary school, but otherwise, it is very much like primary school. They also use different websites or apps, like a dictionary for new Norwegian (nynorsk).

5.2.5. Romania

In Romania, the six children selected for the interviews differed in terms of gender, socioeconomic background, ethnicity, size of the locality and geographical location. The children were contacted via the professional network of the researchers involved in the DigiGen project, mainly teachers who were willing to help. The transition phase in Romania takes place from grades 4 to 5, and for many children, this means staying in the same building or even same class as they were in the primary school level. However, for some children, this might mean changing to a different building, but usually remaining within the boundaries of the same school unit.

5.2.5.1. Romania – Case 25 (MS_RO_CYP_02)

a) Brief case description considering the participant's background

Case 25 is a 10-year-old Romanian girl living in a small village 20 km away from a large urban centre in Romania. Her 4th to 5th grade transition happened within the same school, only by changing the building. Her socioeconomic status can be assigned to the lower-middle class. The school building has insufficient classrooms and does not benefit from state-of-the-art digital equipment. Case 25 was included in the study via the DigiGen researchers' personal professional network. The first interview took place face to face during the summer of 2021, whereas the second one happened online in fall.

b) Conclusion of key findings characterising this case and considering the transition phase

From the interviews conducted before and after transition, it emerges that case 25 is one of the children who is not enthusiastic about using new technologies, with little change occurring between the two interviews. Before the transition, she reported using ICT sparingly, only in the context of distance learning. She is not particularly thrilled, but not scared either, about the school transition. After the transition, and with the return to in-person schooling, her use of ICT has not changed; on the contrary, she reports being happy to not use ICT. Nonetheless, after transition, she reports using the tablet and phone to search for information online for school-related purposes.

With regards to teachers' competences and involvement with ICT, case 25 perceives little difference from before the school transition. However, in 5th grade, she notices that some teachers seem to use them and like them more, while others do not. She is still unable to comment on their digital skills. She reports teachers being helpful during the distance learning phase. Her mother, while willing to help her with homework, does not possess the required skills to help her with technical issues.

Case 25 is one of the two children who did not know what they would become when they grow up. This lack of perspective is rather indicative of the lack of opportunities they are presented with, rather than individual disinterest. She does not find ICT particularly useful for her interests, and she would rather continue learning in person and with physical textbooks rather than returning to online schooling.

She experienced the COVID-19 pandemic as stressful, as she was not able to see her friends and classmates in person. She is not enthusiastic about returning to distance learning schooling as she does not like to use ICT.

5.2.5.2. Romania – Case 26 (MS_RO_CYP_05)

a) Brief case description considering the participant's background

Case 26 describes a boy aged 10 living in a small town near the Carpathian Mountains. His school transition happened within the same school, and he only had to change the building and classroom. He was included in the research via the professional network of the DigiGen researchers. The first interview took place in person in June 2021, while the second one took place online in fall of the same year.

b) Conclusion of key findings characterising this case and considering the transition phase

The ICT equipment and access at school and for school has not changed much during the transition from primary school to secondary school for case 26. Just like in the case of most Romanian children, he is not allowed to use the phone at school (neither before, nor after the school transition). Only teachers use a laptop and projector. In terms of devices used at home for school, case 26 only had a phone before transition, but mentions a laptop after transitioning to grade 5. He only uses his phone to translate things that he does not understand for English class. He uses a video conference tool and messengers to submit his homework (during distance learning) and to chat with classmates (in both phases). He appreciates that technologies can assist him to learn new languages, find images of planets and different spaces on the planet, and find things on the Internet, like how to solve a math problem.

In terms of downsides, case 26 mentions the risk of ruining one's eyes and considers other activities, such as reading books, as more useful before the transition. In grade 5, he mentions addiction, impaired vision and the danger related to talking to strangers online who pretend to be someone who they are not. However, the worst example that comes to his mind is a 10-year-old pretending to be an 8-year-old. In the 4th grade, he wanted to be a policeman and could not see any use for ICT; now, in grade 5, he wants to be an actor and can see how ICT would help him in different roles for movies. Unfortunately, as for many Romanian children, ICT classes are rather boring and not very useful as children are taught outdated information and not practical, useful skills. He would like to learn more about how to make apps and not necessarily to learn about the components of a computer.

Case 26 thinks he does not handle ICT very well and anticipates using them in the same manner after his school transition. He is upset about leaving his former classmates and teachers behind.

Case 26 thinks his teachers enjoy using ICT because they make their job easier. He does find differences between the teachers in 4th grade compared to those in 5th grade, and also notices age differences. In terms of receiving support, he mentions the ICT teacher being available for support. He relies more on his family – brother, mother, and father – for support with technical issues.

The pandemic was stressful for case 26, as it was for a lot of Romanian children. With the shift to distance learning, technologies were used more for online schooling, which he finds strange as he always had to turn on the phone.

Overall, case 26 would like technologies to be used less because many of his classmates are not paying attention, they do not complete their homework, and they just sit at the computer and play.

5.2.5.3. Romania – Case 27 (MS_RO_CYP_01)

a) Brief case description considering the participant's background

Case 27 is an 11-year-old Romanian boy living in a village close to a small town in Transylvania, near the Carpathian Mountains. His transition occurred within the same school, by only changing the building. His father is Italian and so he grew up learning Italian in addition to his mother tongue, Romanian. His socioeconomic status can be considered as middle class. His mother is a counsellor at the school and drives him to classes during the face-to-face learning phases. He was included in the study via the professional network of the DigiGen researchers. The first interview took place face to face during the summer of 2021, whereas the second one happened online in the fall.

b) Conclusion of key findings characterising this case and considering the transition phase

Overall, case 27 has acquired some new uses of ICT during the transition from primary to secondary school. Being a sceptic in grade 4 (stating he did not like laptops, for example), he has grown fond of ICT and admits to improving his digital skills. As most Romanian children, grade 4 was a period of lockdown, where ICT is used more, whereas 5th grade marked the return to in-person or hybrid schooling, in some cases (and therefore, a decreased use of ICT). During in-person schooling, children seldom used ICT and only teachers had access to them (children were also forbidden to have their phones turned on, even during breaks). Case 27 anticipates being allowed to use the phone during the breaks after the transition to 5th grade. After the transition, he feels he has learned more during the pandemic and the distance learning phase, both in terms of managing apps for connecting to the school platform and communicating better with friends.

With regards to teachers' competences, case 27 perceives differences between the primary and secondary schools, with older teachers being perceived as more technology-averse and more reluctant to use technology. He reports cases of his teachers supporting him when he faced problems with technology in both learning phases, during distance learning and in person. However, he reports a clear hierarchy when it comes to sources of support: his mother, cousins, and then his teachers.

Furthermore, case 27 reports knowing about some risks associated with Internet use and mentions in both interviews that using screens too much can damage the eyes. He is particularly enthusiastic about the benefits, thinking that he would one day use ICT to advertise his art as a painter. However, now in 5th grade, he states that he would use technologies less so he could focus more on his studies. This statement suggests that some children still perceive ICT use as being at odds with more serious uses, such as learning.

Case 27 showed particular sensitivity to the issue of inequalities, perceiving that some children do better than others because of the amount and quality of access to digital devices. He wishes for all children to enjoy the same benefits and have the same opportunities when it comes to education and access to technology.

5.2.5.4. Romania – Case 28 (MS_RO_CYP_04)

a) Brief case description considering the participant's background

Case 28 describes a girl aged 11 living in a village close to a small town near the Carpathian Mountains. She attends the school in town. Her school transition happened within the same school, and she had to change the building and classroom. She was included in the research via the professional network of the DigiGen researchers. The first interview took place in person in June 2021, while the second one took place online in the fall.

b) Conclusion of key findings characterising this case and considering the transition phase

The ICT equipment and access at school and for school has not changed much during case 28's transition from primary school to secondary school. She, just like most Romanian children, is not allowed to use the phone at school (neither before nor after her school transition). Only teachers use, at times, a laptop and projector. However, when it comes to using ICT at home, she has several devices at her disposal that she can use for online schooling. In terms of applications used during the distance learning period, she reports having used Google, Google Translate and Wikipedia for researching information for geography and science lessons, and Classroom and Meet to log into online classes.

In 5th grade, case 28 received a tablet from school, which she rarely uses because she also uses her phone for homework. Interestingly, she says she does not need to use ICT for learning and homework because she can ask her parents for the missing information, if needed. She makes cautious use of apps, only opening the secure ones, and mentions asking parents and siblings for help as well as researching information for science class.

Overall, case 28 reports finding ICT useful, but finds ICTs a bit complicated to work with and prefers physical handouts. In terms of challenges of ICT use in class, she reports it was difficult for her at times to understand during the distance learning phase when explanations were not readily available. She mentions viruses and digital harassment as negative aspects of ICT use. Even after the transition, she continues to struggle with technology and prefers face-to-face learning. She is not motivated to learn using technologies and prefers someone to explain things in person. She recognises differences between her classmates, both related to gender and social status, when it comes to ICT use.

As pertains to challenges concerning ICT use at school in grade four, case 28's main teacher was not particularly helpful during the distance learning phase, lacking knowledge on how to use technology herself. However, other teachers helped. In addition, case 28 mentions that her grandparents were helpful (being former teachers), as well as her brother and parents. After transitioning to grade five, there were specific teachers introducing all of the children and young people to the collaborative platform used at school right at the beginning of grade five, showing them how to log on to it. Before the transition, she mentioned the helpfulness of teachers; however, she said her main teacher was quite reluctant to use ICT and would not explain much. Case 28 perceives big differences between their abilities and enjoyment of ICT. Furthermore, she perceives huge differences between her 5th and her 4th grade teachers, as the ones she has now enjoy technologies significantly more.

Case 28 has a moderate view on ICT; she thinks some are useful while others are not because they are time consuming. In grade 4, she wants to be a gendarme and does not envision much use of ICTs in her future career. She does, however, see some practical uses for her everyday use, such as learning languages. She would also like to use some sites better. Her attitude towards technology has not changed after her school transition as she still thinks in-person explanations are better. As a football player, she does not imagine any usefulness for ICT. She is quite critical of the usefulness of the topics she learns in ICT class (something that was mirrored by some teachers and stakeholders) and does not conceal her disappointment.

While case 28 was attending grade 4, the main part of the school year in Romania was affected by school closures and distancing phases due to COVID-19. She was particularly affected by the change, especially as it affected the social aspects of school. In grade 5, she thinks the pandemic has made them use technologies more, but finds this weird.

In grade 4, case 28 mentioned some nervousness in her anticipated use of ICT more, but was confident in her abilities. She admits to knowing more after her school transition.

Case 28 wishes her teachers before the transition were more knowledgeable about ICT and would teach them more useful things after her school transition so that the classes are more interesting.

5.2.5.5. Romania – Case 29 (MS_RO_CYP_06)

a) Brief case description considering the participant's background

Case 29 describes a girl aged 10 living in a village close to a small town near the Carpathian Mountains, where she attends school. Her school transition took place within the same school and she had to change her building and classroom. She was included in the research via the professional network of the DigiGen researchers. The first interview took place in person in June 2021, while the second one took place online in the fall.

b) Conclusion of key findings characterising this case and considering the transition phase

As often was the case of the other children included in the research, case 29 is not usually allowed to use technologies during in-person schooling; only the teachers have access to the class laptop and projector. The music teacher sporadically asks children to look up songs on their phones. Besides this, she is only allowed/asked to use technology when in the ICT class. During the distance learning phase, she mentions using her phone and tablet for attending classes online. After going back to in-person schooling, she mentions using her phone and laptop to do homework. During distance learning, she used Classroom and Google Meet to log into classes.

Case 29 uses the Internet sporadically to search for information for school, both before and after transition. Specifically, she uses Wikipedia and Google. She is quite critical of children who just take the information readily available on the Internet and do not think for themselves. Her teachers provided her with information about most privacy risks, and police officers also came to her school to talk to children about the subject.

Overall, case 29 does not like ICT, especially in distance learning and the 5th grade because she has more homework and school tasks and does not have free time. She appreciates the usefulness of ICT for communicating more efficiently with people. She does not know if ICT would help her in her future job as a veterinarian or a lawyer.

When it comes to her abilities, case 29 considers herself average. She does not anticipate using ICT more after the transition. Her main teacher in 4th grade did not know how to use technologies nor liked to use them and it was the children who showed her how to open apps. In 5th grade, some teachers know how to use technologies more than others and are helpful when children need it. Another source of support is her brother, who has helped her both before and after the transition.

Case 29 admits to finding distance learning quite difficult, especially looking at the tablet to see things. After returning to in-person schooling, wearing a mask was tedious for her. She does not welcome going back to online schooling. She prefers to use technologies less, if possible.

5.2.5.6. Romania – Case 30 (MS_RO_CYP_03)

a) Brief case description considering the participant's background

Case 30 is a 12-year-old Romanian girl living in a small village 20 km away from a large urban centre in Romania. Her 4th to 5th grade transition took place within the same school by changing buildings. Her socioeconomic status is considered lower class. She has a Romani background and attends the same school as case 25. The school building has insufficient classrooms and does not benefit from state-of-the-art digital equipment. She was also included in the study via the personal professional network of the DigiGen researchers. The first interview took place face to face during the summer of 2021, while the second interview happened online in the fall.

b) Conclusion of key findings characterising this case and considering the transition phase

For most Romanian children, use of ICT at school was extremely limited or non-existent during the face-to-face (or in-person) learning phase. In most Romanian schools, only teachers had access to a class laptop and projector, which some would make use of, while others did not. On a regular basis, children are not allowed to use their phones during school hours, with very few exceptions which are usually prompted by teachers. When restrictions lifted and children were back in school, most children reported going back to the 'no-technology' phase before the pandemic. Case 30 is one of the children that did not acquire a taste for technology and was

happy to return to in-person schooling without the use of digital devices. For context, a lot of the distance learning took place with the teachers using low-quality cameras and microphones, which severely impaired the children's abilities to comprehend and participate in collaborative uses of technologies. Children had limited opportunities and support to fully grasp the potential of ICTs for their education and their general lives.

Case 30 did not mention the ICT equipment and access at school, likely because of the school's poor provisions. Moreover, the return to in-person schooling meant, for a lot of children, returning to education without digital tools. Technology was typically only used during the phases of distance learning. For her personal use, she has a telephone and a tablet she received from school. After she was back to school in person, she did not use the tablet much. She mentioned using Zoom, WebEx and AdServio to log into classes during online schooling. She reported low usage of ICT in school or for school after transition. In fact, as it did for most Romanian children, returning to face-to-face schooling meant an almost complete stop in the use of ICT for case 30. However, she does mention looking things up online for Romanian, English, geography or history classes. Before the transition, she was not aware of any risks related to Internet use. Afterwards, she mentioned people being mean on TikTok. Overall, she does not like ICT and does not enjoy using them for school. She does not see their uses beyond learning more about how to do TikToks (and she does not know what she would like to be when she grows up).

Case 30 found the pandemic to be stressful, as she could not go out first and then she could not go out without a mask. She did not encounter school-related or technology-related challenges. She was not particularly worried about entering 5th grade, though she anticipated having more teachers and more classes. Since transition, she uses technology less as school has returned to in-person schooling.

Case 30 thinks that teachers like using technology, both in the 4th and 5th grades, but is not able to comment on any differences between them. Teachers were helpful in the beginning of the pandemic, with helping her set up accounts for logging into classes online. She would, however, prefer to use technology less.

The voices of the children and young people who participated from five different EU countries were set at the centre of this study by having them be collaborators throughout the interviews that followed their transition from primary school to secondary school, a critical time in a child or young person's schooling. The interview narratives show how the participants experienced changes having to do with school and ICT, and how they perceive their school is preparing them for their future lives in the digital age. The five countries in this study have very different education systems, especially in terms of ICT. Insights were gained on how children and young people perceive their education directly from the children and young people themselves as they are the ones who are experiencing the education systems first-hand. These interviews made it possible for the participants' voices to be heard and also created a broad picture of the education systems from their perspectives.

5.3. Results from cross-country comparison of teacher data

The following chapter focuses on the findings of the interviews with teachers from the five abovementioned European countries (Estonia, Germany, Greece, Norway and Romania). These teachers taught classes right before transition and/or right after transition, and refer to different aspects of ICT use in education. In exploring ICT in education, four of the previously introduced sub-research questions are addressed in this chapter, based on results drawn from the qualitative analysis of teacher data in all five participating countries:

(1) How is ICT used in different settings before and after transition into a new formal educational phase and which children and young people, taking into account socioeconomic characteristics and cultural backgrounds, profit from which kind of setting?

(6) What are the long-term effects of the availability of digital media, including the Internet, on cognitive skills?

(7) How do other school actors, e.g. relevant stakeholders, evaluate and rate school education and its capacity to prepare young people for the digital age at relevant phases and transitions?

(8) To what extent do the relevant actors take into account differences in children and young people's backgrounds and characteristics?

Derived from the categories of the qualitative content analysis, which were developed both deductively in the jointly developed semi-structured interview guide and inductively from the data material itself, this built the basis for the following presentation of findings. The following sections provide common cross-national European perspectives as well as distinctive individual findings from different participating European countries. These perspectives are outlined and contrasted.

(1)   How is ICT used in different settings before and after transition into a new formal educational phase and which children and young people, taking into account socioeconomic characteristics and cultural backgrounds, profit from which kind of setting?

- In all participating European countries, access and ability of different types of devices and software is reported, although to different extents
- There are differences regarding the range of digital devices, Internet connection and school levels among the five countries
- In all countries, teachers use ICT for reasons beyond actual teaching and learning in lessons itself, such as teacher collaboration, lesson preparations, organisational issues and classroom management
- In all countries, there are disparities among children and young people that emerge in terms of ICT access outside school across both levels, before and after transition
- Variety of beneficial aspects of ICT use in education in all participating countries
- Different risks and challenges associated with the use of ICT were identified in all countries, such as cyberbullying, fake news and health issues
- Risks arising from ICT use should be addressed in school, and in many schools that the participants teach at, this is already happening in different ways
- Teachers also benefit from using ICT in education, e.g. as a time saving tool, and teachers can teach individually and be more flexible while planning lessons

In terms of ICT access in schools, referring to digital equipment, devices and Internet connection, differences emerged between the data from the five European countries. In all five participating countries, teachers reported having access to and the ability to use different types of devices and to a different extent. In more detail, findings from each country on their individual ICT access and infrastructure are shown in the following sections.

In Estonia, schools, as reported by teachers, are mostly well equipped, with teachers having access to a wide range of digital devices in every class across both levels, before and after transition. This is illustrated by the quotation from a teacher who is teaching after transition in Estonia as follows:

> There are laptops, then we have very good sound- and camera park, then we have some tablets, [...] there were some robotics things. I know we have 3D printer in school [...] this year we had all sorts of document cameras and some things, well, that, and some graphic boards were used. (MS_EE_T_AT_01)

Commonly, young people at school have access to laptops and computer classes, media boards that are used together with the teachers and their personal mobile phones. If needed, these can be replaced with tablets or laptops. In some cases, the school only has one computer classroom with desktop computers that can be used when the teacher books it beforehand. In some cases,

teachers who are teaching after transition have reported about media boards being available in the school, but "still in the packages" (MS_EE_T_AT_03), illustrating that they are not used. Still, from the interviews conducted in Estonia, no differences in terms of schools' ICT equipment and infrastructure emerge between individual schools nor can significant disparities seen between before and after transition level.

Also, in Norway, according to the teachers, in schools, "there is a wide range of technological aids," (MS_NO_T_AT_08) and schools are very well equipped in terms of ICT for teaching and learning, including desktop and tablets, digital boards pens and televisions as well as whiteboards, smartboards, digital textbooks and further licences for different subjects. "In Oslo school are to be 1-1 by 2023" (MS_NO_T_BT_07), referring to the aim that each child or young person attending school is provided with a tablet. However, in terms of hardware, tablets are more common in lower grades and personal computers in higher grades. While teachers state the relevance to have access to hardware for each and every child and young person some teachers are sceptical about the various ways of implementing ICT in teaching and learning, as illustrated as follows:

> Yes, but what is really most important is the access we have to resources here at school. And especially with hardware, like computers and iPads and things like that. I'm not a big fan, I don't think it's a quick fix or any magical solution to anything in school. (MS_NO_T_BT_03)

Although the interview data from Norway schools described them as being digitally advanced, in general, minor differences are apparent between rural and local schools at the secondary level, with the local school having even more variation in terms of ICT available in the school. Teachers that are teaching before transition report a lack of computers for all children and young people at some schools, resulting in groupworks. This is because not all schools have one-to-one equipment or enough devices for the entire class. Before the transition level, teachers refer to the municipal self-government when reporting about availability and use of ICT at their schools, as schools choose and decide for themselves in terms of ICT equipment and implementation.

However, interviews in Romania, Greece and Germany show disparities in the level of digital equipment available in schools at both levels, before and after transition.

In Romania, some schools are reported to have been technologized, whereas others lag behind in technological transformation, thereby increasing disparities between schools and increasing the risk of widening gaps between children and young people's educations, on and with ICT. One such advanced Romanian school, in terms of ICT equipment and implementation in teaching and learning, is described as being innovative with a school leadership that "technologized everything that could be technologized at the school level, starting with the secretariat and up to the classrooms" (MS_RO_T_BT_01), while another teacher refers to the school he is teaching at as "a happy case […] much better equipped and clearly superior to other educational institutions" (MS_RO_T_AT_03). This indicates greater disparities between schools in Romania when it comes to available ICT equipment. Differences between the school levels can also be seen in Romania between primary and secondary schools, with primary schools doing better in terms of integrating ICT. A teacher at the before-transition level in Romania reflects on how their school has been using various types of ICT for years as follows:

> My school was known as an example school. Why? Each classroom had a fairly large TV […], connected to cable, there were 4 wireless networks on that campus, so the whole school space was covered, each teacher had a laptop of his own, on google classroom were created from the 3rd day of the lockdown, all the classes and with the children added and already started the activity. (MS_RO_T_BT_02)

In terms of disparities among the rural and urban areas schools are located in, it was particularly mentioned by a teacher in Romania that schools in cities were not necessarily better equipped than schools in rural areas, explaining "so even though we are in the city, which they say is a bit different in the city, it's not really like that. Not all schools in the city have the possibilities, the facilities" (MS_RO_T_BT_02).

In Greece, on the other hand, differences between schools located in urban and rural areas emerge from the interviews with teachers teaching before transition, emphasising the importance of school unit directors as illustrated in the following quotation:

> It depends on which school unit you are. I was for many years in rural areas, there almost in any school, apart from one that had one projector only in one of the six classrooms, anyway the schools out of the cities are very poorly equipped. (MS_GR_T_BT_02)

Also, differences in terms of ICT infrastructure among individual schools emerge from interviews conducted in Greece, where a teacher states, "We are very lucky! Our school has a projector and a computer in every classroom. It was fully equipped before the pandemic" (MS_GR_T_BT_03). Teachers in Greece frequently report on the classroom that is specifically dedicated to ICT classes, where children and young people are taught basic software, e.g. Office programs, and there is availability of relevant infrastructure for the children and young people to use in school.

Further, at the after-transition level in Greece, differences are revealed between public and private schools. They indicate that, at public schools, the ICT infrastructure seems to be more basic, while private schools seem to be better equipped and have software is more generalised than in public ones. In the former, the best-case scenario is to have a fully-equipped classroom with computers for the ICT course; in the latter, there are schools where children and young people have access to hardware in more classes than the ICT class.

In Germany, differences at different levels are revealed in the interviews across both levels, before and after transition, as regards schools' ICT equipment and infrastructure. Across both levels, teachers report on schools where teaching and learning about and with ICT has hardly taken place "because the technical equipment was missing. There has only been Wi-Fi for teachers since this school year" (MS_GE_T_BT_06). Some schools are reported as still not having wireless Internet connection at all, while other schools are described as being well-equipped and advanced in terms of ICT implementation, as illustrated by the quotes from both school levels below:

> Our school was completely re-equipped in 2017 […] so that every classroom has its own whiteboard with smartboard function. There is a computer workstation for the teacher in every classroom. A document camera, printer. (MS_GE_T_BT_04)

> For a year now, we have had one-to-one equipment […] That means that all students from grade 5 up to 12 are in class with their tablets and collaborate with them, work with them, do exercises digitally. […] We have digital textbooks throughout the school. (MS_GE_T_AT_01)

From the interviews conducted in Germany, it is clear that most primary schools are already well equipped with ICT while the reports of teachers from the secondary school level vary more in terms of schools' ICT infrastructure.

Between and within individual schools at the secondary level in Germany, differences emerge and teachers report, "It really depends on which room you are in" (MS_GE_T_AT_07), since there are buildings and rooms within one school that are not yet well equipped.

> There are beamers in every classroom, and we can work with our laptops and have now also received tablets provided by the state. That's not the case in the old building, where the old overhead projector is still moved back and forth. So, it is very different at the two locations. (MS_GE_T_AT_02)

In terms of **software and applications** available and implemented into teaching and learning, teachers across all five countries report on the varieties of software and applications available for teaching and learning, used to various ways and extents. While a wide variety of programmes are used in Estonia and Norway, efforts are also being made in Germany and Romania to expand the existing variety and to even out the differences between the schools. In Greece, the use of software for teaching is not yet as extensive and digitally advanced as in Norway and Estonia, but what is noticeable is that private schools, in particular, seem to be more digitally advanced compared to public schools. In Greece, too, where the use of software for teaching is not yet

as extensive and digitally advanced as in Norway and Estonia, differences between schools emerge. However, it is noticeable that private schools seem to be more digitally advanced compared to public schools.

While a wide range of software and its use is reported to be quite common in Estonia and Norway, in Germany and Romania, emphasis is frequently put on the pandemic's impact on what actually fostered and/or quickened the implementation of various programs. Above all, learning management systems and video conference tools became indispensable during the pandemic-induced online teaching and learning phases.

> But we have this 'Oncoo', which we already used. We used that a lot during the digital Corona lessons. Yes, and we have now got to know the Flip and also the Padlet. (MS_GE_T_AT_07)

> I have noticed that many schools after this pandemic period have discovered the Internet, they have discovered what many things happen when you have openness and want to learn, and I hope that it will have a positive impact and I want people to understand that this is the future, because this is the future! (MS_RO_T_BT_01)

In more detail, findings on the availability and use of ICT within the five participating countries are shown in the following sections.

As indicated above, especially **in Estonia**, a wide range of programs and applications are reported to be used in class, such as several online editing and collaborative programs, Office programs, and learning management systems across both levels, before and after transition.

> Gmail can be used, the cloud system so Google Drive. There are all kinds of applications, like Docs, Docs-like, there is, named something else I guess, right. Excel, PowerPoint, well, everything, the applications that come with it, with the free version. (MS_EE_T_AT_03)

Regarding the topic of collaborative work, a software is also used to share multimedia tools with different schools. Focusing on the before transition level in Estonia, programs and applications are pointed out that, in exceptional cases, the teachers have to purchase because they use it extensively in teaching and learning.

In Norway, a great variety of applications are in use in the Oslo Municipality schools alone and, in general, there is also a wide range of programs in use in both before and after transition level at schools, illustrated by the following example:

> Office 365 – everything is there – Excel, Word, and sometimes we've got OneNote. Using Teams. We have It's Learning as a learning portal. Now we also have Skolestudio as a learning portal. Yes, we also use Geogebra. (MS_NO_T_ AT_02)

In Norway, teachers teaching after transition report that they and the children and young people "have a package, a selection of programs purchased by the municipality" (MS_NO_T_04_AT). Similar to the Estonian data, the Norwegian data also indicate that there are some limitations, though only minor ones, in that secondary school level teachers mentioned their access to digital resources is partially limited by paywalls.

> I have reading access to some new textbooks and resource packages, but that's just what's free and available to us, that's not all. I know that publishers are great at making packages like this, but when schools don't have the finances to buy access, there are a lot of schools now that sit without teaching materials. (MS_NO_T_ AT_04)

Moving from availability towards actual use, interview data from teachers focusing on the before transition school level in Norway revealed an awareness of appropriate ICT use to be adapted to different children and young people's needs, and a variation in different subjects.

> If the learning technology does not give students any advantage, then we do not use it. […] Are we going to practice, now I'm talking like a math teacher, we will practice some kind of algorithm in the writing book, for instance, then we won't use the iPad for that. If

we're going to make an explanatory video, we'll use the iPad. Otherwise, we can make a combination of writing in the book and maybe filming the process then, for example. […] In my classroom, there's a tool that's in the same position as a pencil or a ruler. You use it when it is appropriate, you do not use the learning technology for something that does not contribute to the pupil's learning. (MS_NO_T_BT_01)

Teachers in Norway pointed out that learning management systems are not only used for distance learning collaboration but are also used during regular schooling as well. This was also noticeable in the shift of children and young people having to work from home during the COVID-19 pandemic outbreak.

The transition to online learning formats wasn't really that big for us. For we were using the tablets in a pretty natural way before this here. With the fact that we gave tasks digitally and that we used many of the production applications even before Corona. So, with our practice, perhaps the biggest difference was that we spent a lot more time on feedback and the process, because it was a little more challenging to help students with work. (MS_NO_T_BT_01)

In Norway, the older the children and young people get and the further they proceed in their schooling, the more they practice being producers of digital media instead of consumers only. They also reported in classes before transition:

On the iPad, we actually use the applications that come with an iPad. After all, it is production applications first and foremost. Where students end up making things instead of consuming what already exists. So, we use Pages, Keynote, Garageband, iMovie, Those types of apps. As a portal, one can call it, then we use Showbie, because it is an app that works very well with the iPads, without so much hocus pocus. It is very intuitive and easy to use, not least it gives parents access that Microsoft applications cannot offer as much. (MS_NO_T_BT_01)

Moreover, using ICT in teaching and learning in school in Norway offers the possibility to check what children and young people in class do on their digital devices. Teachers have reported this as being beneficial:

I have full control over all 30 iPads and I can throw them out of websites if they slip into the world of Safari, which are for games and something they often do. (MS_NO_T_04_AT)

In Germany, teachers reported different programs and apps at both levels; however, most dominant in use are the learning management systems, with variety and frequency varying between teachers. Before the transition, a common feature emerges in the fact that different schools use the same learning management systems. Teachers report that children and young people barely use software in primary school.

At school, we use it quite little. We used this Anton or Antonlin, or the learning workshop, I think it's called. (MS_GE_T_BT_06)

However, in secondary schools, there is a greater variety of applications and programs used, but often only with the older children and young people instead of in classes directly after transition.

With the older ones, of course, many have their own iPads or tablets, where they then work within class, but that is not yet the case with the little ones, because they are also initially, yes, overwhelmed, especially the 5th graders, first have to arrive at school at all. (MS_GE_T_AT_03)

Some teachers explain that the transition into secondary level holds many new things, and working digitally when not even everyone is equally prepared for it would be even more overwhelming.

I don't think the little ones from elementary school are used to digital media yet, and from what we hear, they may have worked with an e-mail program together with their parents, but overall, it's all new to them, and the school has a new building, new

> children, new surroundings, new materials, new rules, and that alone makes for a lot of
> work. (MS_GE_T_AT_03)

Moreover, in comparison to the use before transition, secondary level teachers have reported using some software more frequently, such as note-taking applications, educational institute management software and presentation software.

In general, while teachers at both levels mentioned different software and applications, it also appears that this range of programs is not actually being used to the full extent, not least because teachers "really need some kind of training to get to know other systems. [They] just work with what [they] can, PowerPoint, which is familiar, easy to use, and can be forwarded well" (MS_GE_T_AT_02).

Further, in only a few cases in Germany referring to digitally more advanced schools, it was reported that teachers were able to check children and young people's ICT use at school to a limited extent, while no reports on this topic emerge in the data from Greece and Romania.

In **Romania**, teachers report on access to different types of software and digital resources, e.g. various video conference tools, online quiz applications and collaborative online editing tools, as illustrated by the following on classes before transition into secondary level:

> I used to use Kahoot, I used Google classroom for homework, […] I mean, I put the
> homework and they had to digitally complete the homework in the document, either in
> spreadsheets or in Google documents. I sometimes asked them to make presentations,
> or to work in teams, one to create and share, to work collaboratively. We also used
> Nearpod, a fantastic platform that tracks in real time what students are doing, you can
> share, it gives them centralisation on all their work tasks. Edpuzzle I used a lot and I
> framed it in different subjects, in Romanian, history, I would put videos and I would add
> some questions on the video to check if the students were really connected to what
> they were watching. I also used Word Wall, Learningapps, Hot Potatoes, Quiz for teacher
> which I have used for many years. (MS_RO_T_BT_03)

As previously noted, data from Romania indicate that schools before transition are even more digitally advanced than those at the secondary level. Across both levels, before and after transition, the pandemic's impact on integrating ICT in teaching is a dominant topic. Emphasis was put on how the pandemic-induced need to immediately switch to ICT-supported teaching and learning formats took schools by surprise, and most teachers report that they were not ready to move teaching and learning online as it took time to organise pandemic-induced online formats and the use of platforms. However, as teachers in Germany also indicated, the school's technological conditions are reported to be good, but there are no trained human resources.

In Greece, teachers focus on class reports before transition, which are provided using public software by the Ministry of Education, e.g. "Photodentro [Light tree] of the Ministry of Education, where [teachers] can find many skills, applications" (MS_GR_T_BT_01). While the data indicate that using ICT in Greece at school before transition is most often as part of specific ICT classes, at the secondary level in Greece, it seems that private schools provide access to software that is more generalised than in public schools.

Across both levels, e-classes for asynchronous learning are being held. While primary schools mainly receive new software by the Ministry of Education, after transition, it rather depends on the initiative of teachers, how far software is made available in teaching and learning for children and young people.

> The school provides the students with all necessary software to work in projects and to
> do some presentations in the classroom. It depends also on the way teachers organise
> their class. (MS_GR_T_AT_04)

Despite collaborative work, ICT plays an important role in today's school-related communication, as teachers in Greece reported the use of different messenger groups for communicating with children and young people attending their classes, across both levels, before and after transition.

Teachers in the participating countries and across school levels reported using ICT as a tool of everyday life when **preparing lessons**. In all of the countries, teachers make use of different platforms, programs and apps for other school-related purposes. Further, ICT emerges as an integral part of **organisational and classroom management issues** for teachers in Estonia, Germany, Norway and Romania, while teachers in Greece did not mention this usage.

In more detail, findings from the five countries are shown in the following sections.

In Estonia, in terms of ICT as a tool for preparing lessons, the Internet is essential to search for ideas, materials, videos, etc. Images from online or videos from YouTube are collected for lessons, and (style) editing programs are used while creating study materials, images or figures (e.g. Photoscape), as is social media.

> Then I have tried everywhere, I even use TikTok, but not to watch hours of cat videos, but to watch like biology teachers just right there. (MS_EE_T_AT_07)

Further, teachers in Estonia reported using ICT for assessing children and young people's performance. Teachers in Estonia have online, standard-determining tests and the possibility for automated grading. Teachers across both levels commonly use management software to communicate with children and young people and to insert grades and add lesson plans. These programs are useful for organisational classroom management. While teachers teaching before transition report using email programs (connected with schools' official e-mails), teachers teaching after transition report using Google Classroom, as well Google Drive.

> I have Classroom (a blended learning platform), I still practice with the students to ensure that they know that their courses are still available at home through Classroom. I direct them there, so that those who were absent can find the documents there or submit work there. That this habit remains within them, so that it wouldn't go missing. (MS_EE_T_AT_03)

Estonia reports that teachers use different tools in order to communicate with children and young people across both levels, before and after transition. Tools like eKool, Stuudium, Messenger, Gmail and sometimes Instagram are used to communicate with children and young people.

In all of the participating countries, teachers use ICT for **teacher collaboration**, especially after transition, except for teachers in Greece who did not address this issue during the interviews.

> I have been part of the planning group at the school to work a lot to achieve much more sharing. […] Then you're going to put the resources you've used last year or this year inside these and these folders in this system, but it's hard to do. It's hard to get to that sharing culture. (MS_NO_T_03_BT)

Similar to Estonia, **teachers in Germany**, teaching at lower secondary school make use of a tool to document the grading of children and young people's performances, which is not reported by teachers teaching before transition.

In Greece, those teaching before transition report a certain leniency regarding the requirements from children in their digital competencies. Meanwhile, after transition, it is argued that ICT might even create some problems in assessing children and young peoples' performances, like discipline in the classroom, for instance.

Assessing children and young people's performances using ICT did not emerge from the data of teachers in Norway and Romania.

In Norway, the teachers talk about new communication programs used for homework in primary schools, while teachers in Germany primarily refer to pandemic-induced online teaching and learning phases as pertains to communication on collaborative platforms. Teachers in Romania do not provide any information on this.

As school-related work goes beyond in-school context, in Estonia and Germany, teachers across both levels, before and after transition, report having access to a laptop outside school. While the Estonian and Romanian teachers reported that there are cases where teachers use their

own personal laptops for work, especially after transition, the teachers in Germany are provided with staff devices before transition and only few after transition also use private devices. As in the Norwegian school system, a 1:1 equipment ratio is common as most of the teachers are provided with devices to take home for school-related purposes and have access to school-related software. Data from Greece shows no reports of teachers across both levels lacking access outside of school.

The school setting and ICT infrastructure, and thus the equipment and opportunities for teachers to integrate ICT, are vital to the opportunities given to children and young people to develop their digital literacy skills. However, access to ICT is not always the same for teachers as it is for children and young people.

While young people in **Estonia** are reported to have access to a great variety of hardware across both levels before and after transition in school, young people often have access to mobile phones outside of school, but not computers. Young people in Estonia have different opportunities for using digital devices and Internet connectivity at home, e.g. some children do not have web cameras, which was particularly important to keep up during pandemic-induced online teaching and learning formats, and some schools 'only gave laptops to bring home during distance learning' (MS_EE_T_AT_03), with parents therefore being responsible for the school's property.

> There isn't even a computer at home, and we found it out only when corona came. "we didn't know that not all children can go to a computer at home. Which gave a lot of answers about some children for us. (MS_EE_T_BT_02)

A similar picture emerges in **Norway**, where teachers are equipped with devices and software for use outside the classroom, but there are disparities among the children and young people in terms of equipment.

> Children and young people with different socioeconomic backgrounds have differences in access at home and teachers notice 'that those who have the most are the most digital, the ones who are most digitally competent then.' (MS_NO_T_BT_03)

These inequalities across both levels, as reported by teachers in Norway, are particularly associated with the pandemic-induced online teaching and learning formats, where children and young people in the same class no longer have the same opportunities to complete assignments and participate in lessons.

> So, then we had to rush around ourselves, buy and borrow from the Municipal Education Office, but it happened fairly quickly. Everyone was offered help, because even though many people have a computer at home, most of them do not have so many that it is enough for mom and dad and three siblings who are going to have school or work, so there were many who needed to borrow tablets or PCs. (MS_NO_T_AT_09)

Unequal home access to ICT means some children and young people are not able to do homework or have to go to the library to access a computer. The access to ICT and the parents' competence and attitudes play a role.

> I also have experience with parents who are sceptical towards technology, […] towards data protection inside the EU and things like that. It could be that some parents are also critical of ICT use, but usually it sorts itself out by talking about it. For many, it is instinctive to think of a tablet as a leisure device because they have experienced it like this themselves. (MS_NO_T_01_BT)

In Germany, as well, disparities in out-of-school access to ICT were evident. This became obvious through pandemic-related, ICT-supported teaching and learning formats.

> But (we) nevertheless also had families where the only Internet-enabled device is perhaps the father's mobile phone. And when he's at work, it's not there to work with. We did a survey once and in the first lockdown last year it was de facto the case that about 10 percent of the children either didn't have a digital device or didn't even have Wi-Fi or Internet access, where even a loaner device didn't help. (MS_GE_T_BT_04)

With the outbreak of the pandemic, schools supported by programmes from federal ministries were able to provide children and young people in need with digital devices so they could keep up in times of online teaching and learning formats. But whether children and young people are using school-provided devices or their own, they are still frequently experiencing issues with unstable Internet connection at home, as particularly emphasised by those teaching after transition. This is illustrated by one teacher as follows: "I know a pupil who used to walk to the bus stop to get Wi-Fi. That's just really sad" (MS_GE_T_AT_08). As unstable Internet connection is a recurring issue mentioned in the interviews, it also emerges from the data focusing on the level before transition.

Unstable Internet connection is also a dominant issue emerging from the Romanian data. In Romania, a government project provided the children and young people with hardware after their transitions.

> Only those who needed it, after the list. In the first phase, we received from the city hall a number of about 40 or so tablets that was strictly necessary for those who really did not have. […] In the first phase, a lot of people said, 'I have a mobile phone,' after which they realised that, on the phone, they do not see enough and then the tablet was good, they realised that on the tablet it is easier. (MS_RO_T_AT_02)

Devices provided were still not enough to enable everyone to keep up, as a teacher tells how children and young informed him that they could not participate because of unstable Internet:

> Two aspects were identified, which we normally know: the fact that even if we gave them tablets, children coming from certain more marginal areas of the city did not have access to the Internet, because the signal was very weak and they could not connect, or the fact that there were many children with parents in the house and the conditions in which they could enter online all at once, in one room and with their parents swarming through the room was more delicate. (MS_RO_T_AT_01)

In Greece, before the transition, ICT-related educational inequalities based on socioeconomic and cultural backgrounds were a dominant topic throughout the interviews, particularly with teachers before transition.

> In a school in the province, where there are minorities, with very poor people, I mean from unemployed persons who search in the garbage to military people and lawyers, we have a variety of families. The gap between the children is very big and their possibilities are not at all the same. So, we try to balance a little bit by helping children who are weak in digital technology; we ask them to do something else, something similar. Something that will satisfy them and will have more or less the same results in relation to what we ask learning-wise. (MS_GR_T_03_BT)

This seems to be less of an issue after transition as nearly every child and young person has their own device or can at least share one with another family member.

In terms of creating equal opportunities, in Greece, teachers instructing before transition point out the aspects of school's preparedness in terms of equipment as well as teachers' competencies and willingness play a major role to ensure equality in education. Further emphasis is put on children and young people's individual background characteristics and particularly on the communication between parents and teachers as being important.

> It depends on how mobilised the director is, and it is also very important how much pressure the parents' association is putting. In cities, in general, both the equipment and parents are more mobilised, and most of the teachers have been trained accordingly. (MS_GR_T_BT_02)

Teachers across the participating countries also pointed out **benefits as well as risks of ICT use and how to address these in education**.

With regard to teachers' perspectives on the benefits of ICT in education for children and young people, three main points of argumentation emerged across all participating countries in both

the primary and secondary levels. First, a reoccurring aspect is ICT's potential to motivate and increase children and young people's interest in learning and further in using different technologies. Teachers in Greece, for example, argue that ICT not only motivates but also improves the classroom atmosphere and makes lessons more playful.

> When a child can learn something easily, not in a traditional way, i.e. take the book and read it, it is much more pleasant. And they feel more confident, they feel that they manage and this gives them a good mood in the classroom. So, the climate in the classroom is better. (MS_GR_T_AT_04)

Second, teachers across all participating EU-states report that using ICT in class prepares children and young people for living and working in the digital age. This is necessary as ICT is an integral part of everyday life. Third, ICT can allow children and young people to learn individually at their own pace and level.

In Estonia, teachers add that young people can use a variety of online material available before and after transition. Furthermore, they reported on some children and young people after transition for whom learning at home raised their learning quality, as they did not cope well in the classroom.

> The great advantage of ICT, on one hand, is this, like, more individual learning in the case of some tasks, which means that it is much easier for a student to guide himself/herself. (MS_EE_T_AT_01)

> Who maybe, in the social terms, cannot be in the classroom very well, right, or for some reasons. But being at home alone, their quality of learning like changed. (MS_EE_T_AT_03)

Also, after transition, ICT can enable children and young people who are ill, but still able and willing to participate, to take part in class while being at home.

Not only in Estonia, but also **in Germany**, especially in secondary level, teachers point out the beneficial aspect of giving quick feedback and easing communication between classmates as well as whole class groups. This is also useful between children and young people and their teachers.

> And also students can get in touch with us quicker, that 'Can you just send me this and this again,' 'Can you explain this to me again?' (MS_GE_T_AT_02)

Teachers after transition in Germany further point out the beneficial aspects of ICT for children and young people who always need materials with them in school so they can work on projects during their spare lessons, times available between lessons.

A teacher in Germany teaching at the level before transition brought up how children and young people can work at their own level and pace with ICT. This is especially beneficial when considering children and young people's different language skills.

> So, by the fact that they can choose for themselves what they work on and where, if you have left the free space, this means that everyone can work at their own pace and at their own level, so to speak. Those who perhaps speak less German are more likely to find exercises in easy German. Those who are already fit in German and maths can perhaps practise more demanding things. (MS_GE_T_BT_06)

In terms of individual learning **in Norway**, teachers indicate the beneficial aspect of ICT in education, and explain how it can help children and young people who tend to struggle more at school than others.

> Yes, especially for the weakest students, those who have major learning difficulties, they can still produce a text by dictating to Word or using text pilot, or record an audio file instead. It provides some better opportunities for them. (MS_NO_T_02_AT)

Beneficial aspects revealed in interviews with secondary school teachers in Norway further highlight that working with ICT allows for independence and flexibility, but also promotes collaborative skills. Then, children and young people "are getting better and better at collaborating and using, for example, this with co-writing" (MS_NO_T_04_AT).

In Greece, teachers report that ICT use not only facilitates a teacher's work thought access to much more information and being a time-saving tool, but can also facilitate children and young people's work, can have a positive impact on them, and can help with their self-confidence.

> I'm talking about those who are in the middle; for those, the impact is positive, I think. There, if we succeed something in a digital way, it will attract their attention or they will learn something easier, and their confidence will increase. (MS_GR_T_AT_05)

These technologies can help make lessons more interesting and playful, and further improve the climate in the classroom and appease tension.

In Romania, teachers who express their sceptical attitude toward ICT use admit "it's clear that, nowadays, without [being] digital you can't do anything […] everyone uses the computer, scans, faxes, everything goes digital" (MS_RO_T_AT_02). Teachers in Romania made another point that children and young people "learn to distinguish play for play's sake and constructive play "(MS_RO_T_BT_01), in terms of learning through gaming and thereby developing social skills and moving from being consumers to becoming creators.

> I have to connect them with reality and then, of course, the Internet helps me. It's one thing to tell them stories and another to post the material or have them find certain material themselves. Then it helps me a lot because I can capture the students' attention more easily with these resources, […] Alternating talks with presentations of material in as many different formats as possible keeps their attention for longer. (MS_RO_T_AT_01)

In general, with ICT in education, children and young people learn "that this digital technology is not just fun, it's not just for fun but it can also have an educational role" (MS_RO_T_AT_01).

While a range of beneficial aspects of ICT use in education emerged from the data across five European countries, **different risks and challenges** associated with the use of ICT were also identified. Regarding teachers' evaluation of risks and harmful effects arising from ICT use, three main points were highlighted in Estonia, Germany, Norway and Romania across both school levels. First, the issue of cyberbullying as a great danger arising from ICT was a dominant feature across the interviews. Furthermore, fake news and inappropriate websites that children and young people could easily access were not reflected upon. A third dominant aspect is health issues, like damaged eyesight and hearing, as well as matters of decreased concentration as a result of excessive ICT use.

> Dangers are certainly the health of children, the sight, the hearing, I'll tell right away the earbuds that children have, do they have to be in the ear all the time, I think not. Does the screen have to be in front of the eyes all the time? Definitely not. (MS_T_EE_T_BT_02)

In Estonia, there are dangers of young people becoming addicted to ICT, especially to social media, as "this digital era has made children very little social. This sociality is a very big problem" (MS_EE_T_BT_02). There is, however, also the risk of becoming less social due to excessive ICT use as teachers across both levels pointed out.

> Well, that use of time, it's been talked about also, how time like disappears and you go, I've felt it, how you go to such a place where the physical world doesn't exist, you're just in there. That is the greatest danger. (MS_EE_T_AT_03)

Further harmful aspects considered in Estonia include copying behaviour seen online without reflecting on it, such as in videos uploaded on TikTok, for instance.

Teachers teaching before transition in Estonia mention that topics like digital hygiene, digital waste and cyberbullying are addressed in school. It is addressed either by teachers themselves;

by the school board, if necessary; by school psychologists; or by the police, if teachers themselves lack the knowledge on how to deal with topics, such as digital addiction.

Just as in Estonia, teachers **in Germany** highlight that parents play a significant role in protecting their children from harms that can arise in ICT use, and that awareness needs to be raised towards risks, especially before transition.

Also related to parents' responsibilities to protect their children, by supporting them and being a role model, teachers from Romania highlight that children and young people from difficult backgrounds are more exposed to harmful aspects and risks related to ICT use before transition. Furthermore, children from a very young age have social media accounts that negatively influence their privacy.

In Germany, it seems that some teachers before transition do not feel confident in educating children and young people about risks arising from ICT use, and some primary schools do not address any risks at all. Yet some schools across both levels, before and after transition, address topics like cyberbullying during parent nights, by passing out media passports, inviting experts, founding a special media class, introducing special training for children and young people, or by appointing children and young people themselves as media scouts. Teachers before transition in Germany often address risks arising from ICT during storytelling circles.

> [W]ith regard to the dangers the lurk, this often happens in conversations like the storytelling circle or the class council, when the children report on private situations […] (MS_GE_T_BT_05)

Also, in Greece, the aforementioned risk of being less social and the increasing danger of getting isolated is also addressed by teachers after transition.

> The truth is that when you start to deal with new technologies, you lose the sense of space and time. More particularly, the more you use them, the more you get lost in a digital screen without being able to stop it. This kind of digital isolation can happen anywhere, wherever we are including school, particularly in school. (MS_GR_T_AT_05)

From the interviews with teachers before transition, the message is clear that risks on the Internet seem to increase in adolescence. As a result, schools are addressing risks, particularly referring to Internet safety, as follows:

> There is a safe Internet programme that I personally do. We show some videos, we also made a film in the past, […] we do actions for safe Internet. It points out the risks and we insist a little on attention to the safe Internet as well as the bullying that is done online. But of course, primary school kids exactly because they're not that familiar with technology, they don't face big risks, there are very few exceptions. This is usually a teenage problem. (MS_GR_T_BT_03)

In Greece, teachers try to raise awareness of ICT-related skills and promote a reflective use of ICT among children and young people by using easy-to-understand examples of everyday life.

> One of the things, […] that I will need to do is to dedicate my workshops to safety because the issue is very important. I tell them, let's say, would you take a photo with a swimsuit on the balcony of your house? And magnify the picture, so that those who pass by can see it? I try to shake them a little because I do not know the children have the feeling that when publishing their very personal information, no one will touch them. […] They will work with the prevention centre which has a programme at the end of the year called 'Bridge for high school' and part of this preparation is Internet safety. (MS_GR_T_BT_02)

In Norway, cyberbullying is one of the major risks associated with using ICT.

> Yes, this has moved from physical bullying to digital bullying. It's probably the same bullying, I don't think there's been more bullying either, but it's changed character. These are things that happen on platforms then, or on Snapchat or things like that in

their spare time, while the conflicts are then dragged into the school, and also between students in different schools. (MS_NO_T_BT_06)

Not only referring to social media, but also to the load of information available on the Internet, a lack of concentration and amplified amount of distractions is identified as a risk of ICT use, particularly when being used for school-related purposes. Children and young people might "have difficulty separating the computer as a learning aid and a gaming machine" (MS_NO_T_AT_09).

Further, there is no quality assurance of applications used in schools.

There is no quality assurance of the applications. The City of Oslo has a data processing agreement with a few players, and it is a bit of a grey area, what is going on, to be completely honest. But I can say there is a process now to privacy-approve these applications here. (MS_NO_T_BT_01)

In terms of education on risks of ICT use, teachers instructing before transition highlight teaching critical use of online sources and how to approach online texts, in general.

In Romania, children and young people from difficult backgrounds are more exposed to risks, such as disconnecting and defaulting to games as well as a kind of exclusion by being limited on ICT use at home.

For example, I have a little boy who was orphaned and his mother had to work, and that meant that he was left alone for a bit and went off to play games that didn't make him violent, but took him away from the classroom a bit. He wasn't doing his homework, he wasn't really drawn to what was going on in the classroom, he had to have his phone by his side and be on that platform playing. (MS_RO_T_BT_01)

Further, an extensive use of ICT at school and after school might result in too much screen time and holds risks in terms of damage to the eyes. Just as mentioned by teachers in the other four countries, Internet safety and cyberbullying is highlighted, particularly referring to discriminatory messages, hate speech and false information.

Schools and teachers in Romania address risks arising from ICT use, but teachers before transition also highlight the need of children and young people's intrinsic motivation for learning how to be safe online instead of teachers setting up restrictions and rules that are not negotiated and reflected upon together. Teachers after transition further argue that inviting the police, NGOs or psychologists has helped them a lot in addressing the risks arising from ICT use in school.

Despite benefits and risks primarily focusing on children and young people's ICT use, teachers also benefit from using ICT in education. With regard to teachers' evaluations of benefits to themselves, the aspect of ICT as a time-saving tool making their job easier emerges across all participating countries and school levels. Furthermore, teachers in all countries report that ICT allows them to teach individually and to be more flexible while planning lessons.

With regard to education on risks and harmful aspect of ICT use in the school context, similar findings emerge across the EU-states and across both levels, before and after transition. Teachers across all participating countries point out that risks arising from ICT use must be addressed in school and in many schools, this is already happening, in different ways.

(6) What are the long-term effects of the availability of digital media, specifically including the Internet, on cognitive skills?

Long term effects, which emerge from the data of the interviews with teachers, refer mainly to sustainable transformations induced by ICT use[7]. To get to the bottom of the question, snapshots of respondents' assessments are given that, in the end, lead them to point to two important

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7   As already shown in Chapter 1 when presenting the objectives of DigiGen's focus area 'ICT in education', long-term effects of ICT availability on cognitive skills, including the availability of the Internet, could not be fully investigated. This was due to the COVID-19 pandemic, as the research conducted during this time was unable to provide data that would not give a skewed picture. However, some information could be collected and reported.

areas of concern: beneficial long-term effects of the availability of digital media, specifically including the Internet, as well as harmful assessments and anticipations.

From the interviews conducted with teachers **in Estonia**, there are indications that children and young people suffer from anxiety, learning difficulties and behavioural problems. This might be related to developments of the digital age. However, this is also addressed in interviews conducted with teachers after transition, where it is reported that technology creates anxiety issues as there is too much cognitive load for children and young people when too much and different ICT is used. This highlights that the physical reality is sometimes no longer in balance with the digital environments.

Teachers also face struggles with mental health issues due to ICT use in education. Increased stress and additional work were highlighted as factors of this struggle across all participating countries. Teachers in **Germany, Estonia and Romania** indicate that working time has moved into personal time, and that teachers can be contacted 24/7, thereby leading to additional stress. Those teaching after transition especially expressed this as being a problem.

Teachers in Estonia argue that, after transition, excessive ICT use can decrease the quality of sleep, and that headaches, hurting eyes and poor eyesight can also be consequences.

> Well, in my case, I have noticed there are rather health aspects. That there are headaches, eye pain, well, sight is at all like, well, I should be wearing classes, but I just don't bother. (MS_EE_T_AT_03)

> And, well, with the digital thing, it is, this digital fatigue is like a real thing, it is such a real thing, it totally exists like a separate animal somewhere comes over you. (MS_EE_T_AT_03)

However, regarding the long-term effects, teachers in Estonia report that being able to use ICT after transition does not necessarily mean they are prepared for the future. Reports from teachers in Norway also support this finding, highlighting the fact that, before transition, the digital future is not known and thus it is challenging to know how to prepare the younger generation for a digital age.

> Well, what do we mean by a better preparation? That there are students who manage better with computer, better with technology. Yes, maybe, but at the same time, we can so-to-speak say that maybe this means that they are exactly less prepared. Because it is too easy [...] Does it mean that you are prepared better for life in the digital technological age, it might mean exactly the opposite. (MS_EE_T_AT_01)

When it comes to teachers' evaluations of mental health stressors for children and young people, all participating countries except Greece reported that ICT might lead to children and young people being less concentrated due to there being too much cognitive load for them.

However, teachers from Estonia also state that children and young people before transition mainly learn how to be creative digitally, how to summarise and sort information, how to evaluate information critically and how to refer to sources. In the secondary level, they mainly learn how to differentiate important from non-important digital content, how to present information digitally, how to work with classmates, how to sort through sources critically, and about self-expression and developing their motoric and designing skills.

Teachers **in Germany** teaching after transition add that, younger children and young people especially need physical movement, but this is perceived as being contradictory to using ICT. Meanwhile, teachers instructing before transition in Norway further point to the risk of addiction. In Germany, teachers before transition level specifically report that children and young people learned how to behave in a video conference and about certain rules that apply during a video conference. Teachers after transition state that children and young people mainly learned how to produce content themselves by creating and holding a presentation digitally, keeping order on their digital devices, doing online research, participating in a video conference and uploading assignments online.

Referring to sustainable long-term effects associated particularly with pandemic-induced increased ICT use in education, teachers estimate that the pandemic has boosted digitalisation in schools, and most of them want to continue the digital teaching and learning elements that were introduced as a result of the pandemic and resulting school closures.

In Norway, teachers before transition argue that children and young people improve their creativity due to ICT use, which is similar to what teachers from Estonia argue. They also add that children and young people learn how to use ICT for enjoyment, but also for school-related tasks. Additionally, teachers before transition in Norway add that it is more difficult to keep the children and young people's attention when teaching with ICT because they tend to focus more on the devices and apps than on the teacher. Further, the aspect of an unknown future, especially when it comes to the ongoing technological transformation, poses challenges to the teachers when thinking about long-term effects.

> I don't know what the future looks like. (..). [How am I] going to prepare them (children and young people) for the digital future, because I have no idea what it's going to look like. (MS_NO_T_BT_03)

Teachers state that possible long-term effects of increased ICT use due to the pandemic might include more use of ICT in the future in a teaching context; a change in teachers' views of ICT in a training context, for example; more collaboration in terms of co-writing; and sharing documents.

> The pandemic forces them to use it (ICT), and many have gained from it, or seen the opportunities that they might otherwise have not discovered at the time. I'm thinking it would have taken a very long time. I think there are a lot of people who have been pleasantly surprised, to be honest. And I think the competence of the teachers in the schools in Oslo and the rest of the country have become greatly improved as a result. (MS_NO_T_01_BT)

In Romania, long-term effects of ICT data, to a great extent, refers to the impact of the pandemic by teachers instructing before transition, sharing that COVID-19 and related distance learning had an emotional impact on some children and young people, as some of them have problems adapting to new classmates or changes. They also highlight health issues, like deteriorated eyesight due to excessive ICT use. But also, there is hope in terms of having long-term effects and impact of the pandemic to foster the implementation of ICT in education and further developing teachers' attitudes towards ICT.

> Impact, it will certainly have, now it depends on which. I would be happy if the impact is positive, so that people realise that technology is no longer something to run away from, and that it won't help you or give you anything. Some schools get it, I've seen it. (MS_RO_T_BT_01)

While scepticism is expressed, teachers have concerns of missing out sustainable long-term effect of the pandemic-induced ICT use.

> I'm afraid that Romanian education hasn't learned anything from all this. It is enough to see that educational policies in this regard are not coherent, there is no consistency, they still go wrong. They don't understand that technology in the classroom is not a fad, it's not a situation that 'wait a minute, the pandemic is here and we don't need it after it passes.' (MS_RO_T_BT_03)

In Greece, teachers do not mention any stressful long-term effects of ICT use, in particular. Instead, using ICT is described as fostering social skills, as children and young people "developed communication skills because they had to teach each other, help each other, explain to each other" (MS_RO_T_BT_01). Teachers in Greece teaching before transition felt that, especially for teachers who were not very familiar with ICT, they need a lot of time to get familiar with the devices.

Still, in terms of beneficial aspects and long-term effects of ICT use for children and young people, fostering creativity is reported across interviews with teachers in Estonia, Germany

and Romania. In Estonia, further competences are pointed out, such as summarising and sorting information, evaluating it critically and learning how to express themselves. In Greece, teachers before transition classes argue that familiarity with using ICT for schoolwork is gained by children and young people, while teachers after transition state that ICT might also have contradictory long-term effects as those who already have some competencies can even get better, while those deprived can be further excluded.

> I think digital technologies magnify social inequalities as well. Because the rhythm is faster, so the inequalities are geometric. The pace speeds up the gaps. New applications, new 'all this' have to be paid for, so the newer ones need to be purchased. (MS_GR_T_ BT_02)

(7) How do other school actors, e.g. relevant stakeholders, evaluate and rate school education and its capacity to prepare young people for the digital age at relevant phases and transitions?

- Some teachers express concerns when it comes to the school education and its capacity to prepare young people for the digital age, such as digitalisation getting out of hand, traditional ways of teaching and learning not being used anymore, etc.

- There are several competencies that are considered important for children and young people in the future, such as a goal-oriented way of using digital devices, a critical reflection on digital media and becoming a good digital citizen.

- Teachers in all participating countries, before and after transition, agree that schools have a huge responsibility in preparing children and young people for living and working in the digital age.

- Parents play the most important role in preparing children and young people for living in the digital age, as well.

In terms of teachers' willingness to integrate ICT into teaching, findings from **Estonia** and **Germany** indicate that teachers are concerned about the possibility of digitalisation getting out of hand. The teachers raise issues, such as social relationships and 'being outside,' elements that teachers highlight as being important for children and young people but which they may miss out due to increased ICT use. Furthermore, teachers in Estonia and Germany point out the importance of remembering the traditional ways of teaching and learning using an analogue book. One teacher before transition in Germany adds that, especially first and second graders, should learn how to work with a pen and paper before learning how to handle digital media:

> In my opinion, it is more important for the first two classes to learn how to get along with pen and paper, because I think that, otherwise, it might be a bit overwhelming at some point and they might use digital media in between. (MS_GE_T_BT_06)

In Norway, many teachers were sceptical at first, but got used to working with digital media and learned how to use them efficiently in class. To add, one teacher from Romania states that it is necessary for teachers to actually try to use digital media, also in teaching and learning, in order to develop digital skills (MS_RO_T_BT_01). Teachers in Greece add that the teacher's age and the school can also influence whether ICT is incorporated into teaching and learning.

Unknown future? How to prepare adequately for a digital future considering rapidly ongoing technological transformations?

Regarding competencies that teachers consider important for the future, teachers in Estonia, Germany and Norway have made three main points. First, children and young people must learn how to use digital devices in a purposeful or goal-oriented way. Second, children and young people should learn how to critically reflect on digital media and sources and information found online. Third, children and young people must also learn how to be a good digital citizen, which refers to learning how to behave properly in the digital world. Teachers from Norway who are teaching after transition also add that children and young people must learn how to sort irrelevant information and

focus only on the important information that they find online. Teachers from Germany stated that children and young people must learn about data protection and be competent in using classic applications like Word and PowerPoint. In Romania, however, teachers make a different argument. Teachers after transition in Romania mainly state that children and young people should still be kept in reality, and that children should learn not to be scared when working with ICT. Teachers from Greece argue that digital competencies are crucial for working and living in the digital age, in general, and secondary school teachers further add that adolescents typically have digital competencies, even those who are economically deprived.

Regarding competences that teachers actually use to prepare children and young people for the future in a digital age, one can say that the three main points mentioned above are also mainly taught in schools. So, teachers in Germany, Estonia and Norway report teaching children and young people how to use digital devices in a purposeful way, how to reflect critically on different sources and digital media, and how to behave in the digital world. One individual teaching before transition in Estonia, however, argues that he/she does not teach any competencies in ICT or the digital age. Further, secondary level teachers from Estonia also focus on mental health issues and teach children and young people that the digital world is manipulative. Teachers in Norway add that they teach their children and young people about data protection, too. However, in Romania, teachers teach children and young people how to use digital devices, how to use different platforms and about risks arising from ICT use. They feel that these skills allow children and young people to safely use the Internet. Further, a sceptical approach to ICT is reported in Romania by those teaching after transition. In Greece, the importance of ICT is taught in primary schools, and children and young people who are weak in ICT are encouraged in secondary schools to further develop their digital skills.

Regarding a teacher's role in preparing children and young people for living in the digital age, it can be said that teachers across both levels in the participating countries, before and after transition, agree that schools have a large responsibility in preparing children and young people for living and working in the digital age. Teachers in Germany and Norway report that responsibility lies in the cooperation between schools and parents, and that teachers can make parents aware of the important points of media education. Teachers in Estonia highlight that, before transition, teachers must keep in mind not every child and young person has access to digital devices at home and that assignments cannot only be done digitally. Further, individuals in Estonia teaching after transition argue that their colleagues should introduce the possibilities of ICT to children and young people. In Germany, those teaching before transition perceive the main task for teachers as teaching how to find information, how to check sources, and how to check if the information found is correct and reliable. Moreover, secondary level teachers highlight that children should be able to learn about media education at school, especially if their families do not have the skills to teach them this at home. Teachers in Norway before transition add that educators must control what children and young people are doing on their devices, whereas teachers from Romania in the same position argue that they should not overburden them with ICT. Further, teachers in Greece working in classes before transition argue that ICT is taught insufficiently in primary schools, with only one hour a week focused on the topic.

Regarding parents' roles in preparing children before transition for living in the digital age, teachers in Estonia, Germany, Norway and Romania emphasise that parents play the most important role in this matter since they are the ones providing them with devices and who can limit their screen time. Teachers across both levels in Germany, before and after transition, argue that teachers cannot replace parents, and that parents must control what their children are doing on their devices in their free time. Teachers in Estonia mention that parents must function as role models that have a positive influence on their children, and that the first responsibility of preparing children for living in the digital age lies at home. In Greece, some teachers argue across both levels that parents are not considered capable or interested in helping their children acquire digital competencies and, therefore, seem to not be involved in preparing their children and young people for the digital age.

Regarding the challenges in identifying responsibilities, the data reveals that in Estonia, Germany, Norway and Romania, both parents and schools are considered responsible for preparing children and young people for living in the digital age. Secondary level teachers in Estonia further point out that the government and ministry are responsible for integrating digital education into school education, and teachers across both levels in Estonia also argue

that parents are the most responsible, followed by the teachers. Teachers in Norway agree with teachers in Estonia, whereas teachers from Germany emphasise that teachers and parents should collaborate since parents often lack the time and equipment and the schools are equipped better. They also assert that every subject should integrate digital education. Teachers educating in classes before transition in Romania add that it is harder for parents to understand that digital media plays a significant role in daily life, which is why there is a huge gap in the understanding between parents and teachers. Teachers in Greece state that ICT is generally neglected in schools and that teachers report that they do not have the time and possibility to work on digital skills acquisition, while parents also do not seem to be capable of preparing their children for living in the digital age.

(8) To what extent do the relevant actors take into account differences in children and young people's backgrounds and characteristics?

- Children and young people who have no good access to digital devices or simply do not use them at home are often disadvantaged in class and lack important skills that other children and young people bring to class.

- Teachers are faced with various challenges when it comes to integrating ICT into education, on the individual level as well as the administrative level.

- Challenges with integrating ICT can also arise in the context of transition phases, as some children suffer a disruption in their digital education biography during the transition, which needs to be prevented.

- Teachers need strategies, ICT infrastructure, technical and pedagogical support, and toolkits to integrate ICT in teaching and learning.
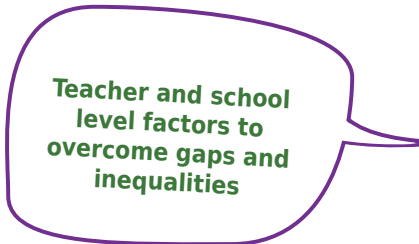
With regard to the teachers' perceptions of differences between children and young people's familiarity with ICT, similar results have been found across all participating countries, before and after transition. The most important point that was made is that those children and young people who do not have good access to digital devices or simply do not use them at home are also disadvantaged in class and lack important skills that other children and young people already bring to class. One teacher from Estonia states that

> [H]omes, where children come from, are different and today there are a lot of homes, who are very close to nature, who don't use digital devices at home, so that the child might learn a lot at school because he/she does not have these opportunities at home. (MS_EE_T_BT_02)

The importance of schools' willingness and preparedness to integrate ICT in teaching and learning to enable children and young people to develop digital literacy skills for a digital life becomes very clear in this context. Another aspect that has been mentioned in **Estonia and Norway** is that children and young people who have better learning and self-control skills manage to integrate their teachers' facilitations and study material better in a digital environment. **German** teachers highlight that "the younger the children and young people are, the less experience they have with computers" (MS_EE_T_BT_02). Furthermore, secondary level teachers in Germany have the impression that 5th graders are not as interested in using digital media, and there is not only a difference in terms of knowledge but also in terms of motivation and interest in working with ICT. This is something the other countries did not mention. Teachers from **Romania and Greece** further add that ICT reinforces existing differences, which is another important point that should be taken into consideration.

All teachers reported on differences among children and teachers across both levels, before and after transition, except for Norway (only before transition) and Romania (only after transition). These differences are due to the unequal access to ICT, which is linked to individual backgrounds as well as individual levels of schools in terms of preparedness and willingness to integrate ICT. While the **Estonian** teachers report no perceived difference between the transition phases, the teachers from **Germany, Norway and Greece** specifically point out the lack of communication between schools before and after transition when it comes to the children and young people's digital competences. This observation is apparent after transition, in particular. While teachers

educating in classes before transition in **Norway** report that ICT can help with social aspects during the transition, one teacher in **Romania** emphasises that there are many benefits to using ICT before transition, and teachers working after transition in Romania recognised that face-to-face learning is becoming less important. Teachers in **Greece** highlight the fact that children must be better prepared better for the transition phase.

Teacher and school level factors to overcome gaps and inequalities

Therefore, factors at teacher and school level are particularly relevant and should be taken as opportunities to work towards overcoming gaps and inequalities among children and young people and foster inclusivity in ICT. In this context, findings show that, in all of the studied countries, there are strategies on the integration of ICT offered on the school level. The teachers in **Estonia, Germany and Romania** make use of (external) training on ICT, among others, while the teachers in **Norway** use local expertise in schools. Teachers in **Greece** report that private schools have a greater variation of strategies in place. In all of the reporting countries, the teachers had different experiences with strategies at the school district level. While one teacher from **Estonia** teaching classes before transition emphasised the importance of a supportive community, teachers after transition in Norway reported that it is unclear if there is a national strategy on the matter. Moreover, the provided in-service courses that educators teaching before transition in **Norway** take do not seem to be implemented in a systematic way. This observation was made in Romania as well, where educators teaching before transition reported that the state provided no or insufficient support. Only some schools were supported at the city level. In **Greece**, teachers teaching before transition argue that they are unsatisfied with the Ministry of Education's help, and after transition, most help comes from sponsorships and other private or ad hoc initiatives. In **Germany**, national strategies are mentioned by educators teaching before and after transition, but they are also criticised in terms of implementation. Further, schools work with companies who support the school by supplying them with digital devices.

In **all of the participating countries**, teachers pointed out several challenges they face when integrating ICT in education, such as the amount of time required to integrate ICT in lessons, feeling stress to be available online all the time, and feeling pressure due to the comparison with other teachers or ICT-related bullying, across both levels, before and after transition.

While teachers in **Germany** talked about the lack of devices and Internet, teachers in **Estonia, Norway and Romania** mentioned obstacles and challenges such as the lack of financial resources, knowledge and digital devices, and time provided in the ICT curriculum. In **Greece**, teachers both before and after transition argue that it mainly depends on the teachers' willingness to integrate ICT into their teaching and learning. In the context of overcoming challenges and foster ICT integration, the topic of best practice toolkits was addressed among the interviewees. The teachers in **Norway** did not provide information on well-known toolkits, but instead share experiences on exchanging information and materials, and how they gained inspiration on social media groups and forums for teachers. The teachers in **Estonia and Romania**, however, mention several examples of best practice toolkits at both levels, before and after transition. The majority of teachers in **Germany** and **Greece** report not being familiar with any best-practice toolkits. However, teachers in **Estonia, Germany, Romania and Greece** express several wishes in the context of best practice and toolkits for teachers to use in order to integrate ICT into their classrooms. In **Estonia**, the teachers desire changes in the digital environment, in particular. The teachers from **Germany** and **Romania** are looking for more ease and support, such as a simple guide with concrete examples of lesson plans that integrate ICT or using toolkits as part of the teacher training on both levels, before and after transition. One teacher from **Romania** wishes for

> [a] simple guide that would meet the needs of teachers - basic notions about editing, drawing, presentations etc – with an introduction to every program, not everything in detail, but a bit of each. (MS_RO_T_AT_03).

Teachers in **Greece** teaching after transition want a toolkit that helps them improve their teaching.

> To enable teachers to learn tools that are more flexible, fresher, newer, that can be used in this direction. (MS_GR_T_AT_04)

Teachers in **Estonia, Germany and Romania** have reported that older generations struggle more with integrating ICT, especially after transition, in comparison to younger teachers. Meanwhile, in **Norway, Greece and Estonia,** generational differences did not emerge from the interviews, but instead there were differences among teachers of different subjects. Data from **Romania** shows that many teachers have been reluctant to use ICT in education, and only did so because of the pandemic and its impact in terms of distance learning.

> Many colleagues were reluctant to use digital technologies until the pandemic, then they were forced to use them […]. (MS_RO_T_BT_02).

Teachers in **Greece** agree and state that ICT use can be helpful in some subjects and lessons, but that different methods/materials work better in other subjects. No teachers in **Norway and Romania** provided similar information.

Overall, interviews with teachers across both levels, before and after transition, in all countries indicate a desire for improvement to different extents. While the teachers from **Romania** talk about the need for better access to ICT (the need for an interactive whiteboard is mentioned several times from teachers before and after transition), the teachers in **Estonia, Germany and Norway** express several varying wishes, such as more devices for all children and young people, a clear concept of using ICT while teaching and more specialists/support for using ICT (IT specialists, consulting hours, etc.). Moreover, teachers from **Greece** argue before transition that they want more hours of ICT class and for digital classes addressed to parents, whereas after transition, they want more training for teachers and for measures to help deal with digital deprivation. Furthermore, the teachers **in Estonia** emphasise the need to tackle and overcome the fear of using ICT, which is still prevalent and hinders some teachers from harnessing the potential of ICT for teaching and learning.

Addressing teachers' wishes, including needs for strategies, ICT infrastructure, technical and pedagogical support, and toolkits to integrate ICT, is vital for creating opportunities for children and young people to develop digital literacy skills and to provide equal opportunities. Inclusivity in ICT is key to overcoming gaps in children and young people's digital literacy across Europe.

5.4. Relevant stakeholders' perspectives on implementing ICT in education and schools' capacity to prepare younger generations for the digital age

Drawing on the interview data collected and interpreted separately by each country team, ensuring discrete, context-sensitive findings, the perspectives of national stakeholders from five European countries are portrayed, highlighting key findings on four core issues. Contextual information is provided for each country. First, it is addressed in terms of the national stakeholders' professional backgrounds that have shaped their perspectives. This is followed by a section addressing strengths of ICT in education and further vulnerabilities. Finally, an overview of statements and approaches for improvement when it comes to educational policies is provided. This focuses on technological transformations and its impact on education and the actual implementation of ICT in education, considering the relevance of formal transition phases in education.

5.4.1. Estonia

5.4.1.1. Various perspectives of national stakeholders in Estonia

In Estonia, interviews were carried out with three members of the national committee of the DigiGen project. Two interviews were in person and the third interview was conducted via Zoom. Each national stakeholder committee member represented a different perspective in relation to the DigiGen project and its objectives. While one of the interviewees was from a public sector organisation, two of them were from different NGOs.

Each participant signed an informed consent sheet to participate in the study. The Ethics Committee of Tallinn University approved this consent sheet beforehand, and it provided all the necessary information regarding the DigiGen study and the participants' rights in the context of the interview.

The first interviewee (stakeholder 1) represents an NGO that works in the mental health field. It functions as an umbrella organisation and currently brings together 43 member organisations whose statutory purpose is to promote mental health and well-being. The NGO is in a strategic partnership with the Ministry of Social Affairs, and therefore contributes to the national policies that address mental health and well-being. Stakeholder 1 describes his main role in the organisation as bringing together the right partners and governing the organisation as a strategic partner for the Ministry of Social Affairs. In relation to the school and education system, he sees the role of the NGO in providing universal prevention for schools in the field of mental health and well-being. Interestingly, as it emerged from the interview, stakeholder 1 has previously worked as a teacher at a general education school, thereby offering valuable input to the interview topic.

The second interviewee (stakeholder 2) represents a government agency of the Ministry of Education and Research. The agency is relatively new as it was formed in August 2020 as a result of merging four public organisations in the fields of education and youth work. Stakeholder 2 used to work in one of the organisations that merged with the agency. At the time of the interview, her main responsibilities revolved around digital youth work with the goal to promote preparing young people for their future. This becomes important as the organisation addresses the idea in which non-formal learning outcomes are to be taken into account in the formal education system, allowing to create more personalised learning paths for young people.

The third interviewee (stakeholder 3) represents an NGO that works in the field of children's rights and promotes a child-friendly society. The NGO is an umbrella-organisation that has 22 legal entities with members whose statutory purposes are related to protecting and promoting children's rights. Stakeholder 3's main tasks include running a project that is devoted to smarter Internet use by children and their parents. The project provides training sessions and seminars for children, parents and teachers, and also raises awareness among the general public regarding smarter Internet use.

5.4.1.2. Strengths of ICT in education, teaching and learning with and about ICT

During the interviews, all three national stakeholder committee members brought up several strengths and possibilities regarding how ICT could and partly already does benefit education in general, as well as teaching and learning. Interestingly, the strengths brought up varied quite a lot among the interviewees, reflecting the diverse ways in how education, teaching and learning could benefit from using ICT.

As stakeholder 1 describes, ICT has a great deal of potential to support the learning process, yet he has only seen a few examples of this potential being harvested.

> And while we can support this learning process a lot with digital technologies potentially, I have seen very little where it is actually being done successfully in a manner where actually, it deserves to be spent a lot of time on at school. (Stakeholder 1)

Still, ICT offers more efficacy, for example, when collecting information on children and young people's performances. In doing so, it can allow children and young people to be evaluated in an on-going basis instead of sporadically evaluating their performance. This way, teachers would have better insight on the children and young people's development while also reducing the teachers' workloads when it comes to evaluation and grading. He adds that ICT makes it possible to shape the learning process according to the children and young people's level, at least to some extent and in line with the learning outcomes.

> There is a lot of potential in the direction of making this learning process more appropriate to the students' level within a certain framework. (Stakeholder 1)

He continues by stating that, while the social environment is the main tool for learning and teaching, ICT could supplement and support it. In addition, ICT allows for more flexible learning forms, yet for that to be fully implemented, he adds that a paradigm shift is needed in teaching and learning. When it comes to children and young people's benefits in using ICT, he brings up an example of differences among children and young people by saying that children and young people who are more capable of concentrating will benefit more from using ICT.

> A student who is better able to direct their attention is more likely to benefit from this digital technology because he or she is better able to keep the focus on the appropriate thing, the right thing. (Stakeholder 1)

Stakeholder 2 also brought up more flexible forms of learning, using an example from the COVID-19 period when distance learning helped children and young people avoid learning gaps. On a similar note, ICT holds a great power in escalating knowledge or learning from the teachers' perspectives. While in school, teachers might work with around 30 children and young people at a time, yet ICT tools would bring that knowledge to thousands of children and young people at the same time.

> One thing, for example, when we look at it from a teacher's point of view, is the escalation that when I am in front of the class, I have 30 or 24 students there, and what I say there, stays with those 24. When I talk into a so-called video, it's possible to escalate it, so this 24 can change to 24,000 and more. (Stakeholder 2)

Stakeholder 2 also adds that, with ICT, one can have very diverse learning materials, thereby allowing children and young people to use the materials that they find suitable for their learning needs. This also creates the advantage of being able to develop self-directed learning from quite an early age onwards as children and young people can choose and use different materials. Related to this, stakeholder 2 also brings up the fact that ICT supports the development of talented children and young people so they can realise their full potential.

> And study materials [...] if they are well-structured, then they are more diverse, you have many options, as you also have in the textbook. To whom this is more suitable and to whom that is more suitable, that he or she pushes these buttons and listens and reads and looks. The advantage is that you can encourage a self-directed learner already from an early age. (Stakeholder 2)

A similar idea is found in the interview with stakeholder 3 as she points out that ICT creates an opportunity for children and young people to learn more deeply about a subject or topic. It also widens the path for how a subject can be acquired or how learning can be performed. For example, ICT allows for exciting and interesting solutions in learning, for groupwork and for collaborative work.

> The advantage is definitely that it actually allows you to offer clever, exciting solutions and groupwork and joint works. That it expands the possibility [...] combining digital learning with the physical side, to link them together. As for one task, to be done in the digital environment, it can also be linked with the physical environment. (Stakeholder 3)

Technologies can bring together children and young people from different schools or classes. She also adds that ICT can help the children and young people develop their learning habits, responsibility and time management skills, among other new skills. "It perhaps provides an opportunity to go deeper, explore more, and create this learning habit and responsibility on one's own" (Stakeholder 3).

To summarise, ICT has the potential to foster individual learning practices and create exciting possibilities for groupwork. It also has the power to reach more children and young people than teaching in the physical classroom. One crucial aspect, however, is that the children and young people who are able to focus more on class are the ones who will most likely benefit more from the use of ICT in classroom.

5.4.1.3. Vulnerabilities of ICT in education and teaching and learning with and about ICT

In relation to vulnerabilities of ICT in education, as well as teaching and learning with and about ICT, all three interviewees reflected on the risks that ICT holds. It emerged that the risks are related to the strengths discussed above, as it can mainly be narrowed down to asking how and why ICT is used and how it is balanced in the social environment in schools.

There are multiple risks that stakeholder 1 sees when discussing the disadvantages of ICT in education, teaching and learning. Firstly, he reflects on his own experiences when working as a teacher and the fact that he noticed ICT is used in school just for the sake of use, instead of focusing on the pedagogical and didactical added value of ICT use. Instead, it should be seen as a tool to achieve something or to support the learning process. He also adds that ICT brings in an interfering factor as there is a constant need to check the phone in order to see whether there is something new happening, referring to this as the fear of missing out. Stakeholder 1 explains this with the idea that the phone offers more interesting things compared to the class itself, and for a teacher, it is very difficult to offer something more attractive during class. He also described that, when working with children and young people and having them collaborate on solving a practical problem, it was much more difficult to do when children and young people were "behind the computers." At the same time, collaboration between children and young people when problem solving offers a situation for learning (not sitting "behind the computers"). Another risk that stakeholder 1 brought up is the fact that ICT might also encourage de-personalisation. This is when teachers form an understanding or conclusion about a children and young people's process based on the data they see about the child or young person (grades and results via the app). This leads to reducing a person, a human, to merely a number or a statistic.

> Risks are in applying a non-personal approach - that when we start thinking that, what we get from the data about this student from an app, from some kind of data summary, and when we believe it [the data] tells us what's going on with that student or that this is how we actually communicate and handle the student, then this could lead to this de-personalization where the student is a number, a statistic and we solve this statistic, instead of solving the challenges the student has. (Stakeholder 1)

Another interesting term that stakeholder 1 brings up is the invisible (imaginary) audience. The perceived attention cannot end if one has a digital life as the perceived attention is present in the digital world as well. This leaves a young person with the constant perception that he or she is at the forefront of everyone's attention, whether in the physical or online world. He adds that, without the digital world, a child or young person might have a break from this perception when coming home after the school day, yet with the digital life, this constant feeling of being in the centre of attention lives on.

Stakeholder 2 adds that ICT offers a great chance to get lost and lose one's attention, similarly to a point that stakeholder 1 addressed. Another challenging aspect of ICT is mental health connected to children and young people's ability to self-regulate screen time. She explained the idea that, for children and young people, it is significantly more difficult (compared to adults) to say no to screen time because it is actually entertaining and fun. She stresses the importance of understanding that people's brains also need a break from the digital world as the latter tends to take a great deal of attention.

> The other downside is, so to speak, one's mental health. And mental health from the side of being self-directed is, on the one hand, whether I can motivate myself to learn, and, on the other hand, whether I can train my brain so that we are off screen now, as in, now I turn you off for the meantime. [...] Also, self-control for a child is much more difficult to do because of the fun and entertainment - how to say no, I won't do that because I know that it is actually bad for me. (Stakeholder 2)

Stakeholder 2 adds that ICT cannot replace general competences and social skills. While (social) networks connect people, these connections and the depth of the contacts are not as strong in the digital world as they are in the physical world.

> When we talk about people's general competencies, these social skills, this is the part we cannot replace [with ICT]. (Stakeholder 2)

Stakeholder 3 shares this perspective with stakeholder 2 regarding how ICT cannot completely replace social interaction and development that occurs when in a group, as digital learning is based more on individual learning. Still, for their development, children do need to communicate with each other in the physical world, to be together and play together.

> Well, the primary aspect is that children need each other, well for their development already, physical interaction with each other, being together and playing. (Stakeholder 3)

In addition, ICT cannot replace fine motor skills. Reflecting on the times of distance learning, stakeholder 3 also brings up that empathy is lost while behind screens, as is the synergy. She continues by stating that social interactions were missed during the time of distance learning. She adds that digital learning allows to become more anonymous, yet the personal approach is very important, especially at early ages.

> The digital way of learning allows us to become anonymous, but at the same time, a personal approach to learning, especially in the beginning, is very important. (Stakeholder 3)

Another risk she sees in using ICT is the homogeneous use of ICT together with the habit of use. With the latter, she adds an example of being used to checking one's phone all the time, resulting in a lack of attention – an idea that all of the interviewed stakeholders mentioned.

5.4.1.4. Educational policy on ICT in education and the actual implementation considering the relevance of formal transition phases in education

Educational policies on ICT in education and the implementation of ICT in schools

Stakeholder 1 mentions the idea of using ICT in school only because the use itself (referring to the quantity of use) is fed into schools from educational policies. Of course, the policy itself does not spell it out in such a manner, but still, the focus, according to him, is on the use as a separate goal itself. Instead, one should ask why it is important to use digital tools. He also brings up a gap between national curricula and syllabi. As he described, the curricula bring up general competences to support systematic learning and the transfer of learning. These general competences (including digital competence) should be promoted and taught throughout all subjects. Unfortunately, the syllabi do not support the general curricula, leaving a gap between skills and knowledge gained in a subject and the general competences. The subjects tend to only focus on the topics that are important in that specific subject and less attention is paid to general competences.

Stakeholder 2 brings up the fact that, from the national level, ICT is considered important and its use in education is supported from the points of finance and actions. This means that schools have opportunities to develop their implementation of ICT in schools through various projects. She does bring up that, in the field of youth work, there is a danger that this area is forgotten. However, in educational policies, ICT is strongly integrated. For formal education, in order to be able to successfully implement ICT in schools, organisational, infrastructural and staff (teachers) factors are important, as only then talking about the digital competences of children and young people.

Stakeholder 3 reflects on general development plans as something that cover ICT well. Yet, for example, with the preschool curricula, ICT is implemented too generally. Still, both the curricula and lifelong learning (referred to as development plan and strategies) bring up digital competences. She concludes that today's educational policies and development plans do include digital competences.

Approaches and suggestions for improving the implementation of ICT in schools

The following suggestions, practices and approaches that the interviewees brought up should not be considered as something that has not already been implemented. Instead, it is important

to consider how, in general, to improve the implementation of ICT in school. The interviewees did not discuss these topics as something new or something that is not being implemented yet, but rather presented them as how it should be implement ICT in schools.

For example, stakeholder 1 mentions that when teaching children and young people how to manage their emotions, the same teaching and learning should be universal enough that the very same skills and principles in behaviour can be implemented in the digital world. Also, when teaching more specific digital skills and competences, it is important not to teach them separately from so-called real life, but to integrate them into real life and teach them in collaboration with reality.

Currently, after the distance learning and digital education period due to COVID-19, stakeholder 1 considers it important to allow schools to test, try out, experiment and develop the use of ICT in schools in order to understand what works best and what would most benefit the learning process. If given the opportunity to change curricula, he would remove everything that forces the use of digital tools just for the sake of using it. For him, the importance is on meaningful ICT use. On that note, stakeholder 1 brings up the question of how to consider education in regards to digital skills as the basic skills (writing emails, using text editing software) have not changed over time, leaving the basic skills needed for the future the same. Therefore, schools should teach basic, general skills, including how to behave on social media instead of how to use TikTok, for example.

Stakeholder 2 highlights the need to improve children and young people's digital skills. For this, she offers a tool called Digital Mirror, which is a tool for schools to conduct self-evaluations in regards to ICT use in school. Digital Mirror provides an opportunity for the school to map their digital maturity and manage digital innovation by setting goals. She also reflects on the issue of sparsely populated areas in Estonia, which has resulted in schools with only four or six classes. In some cases, there are not enough children and young people to open more classes, while in other cases, there are not enough teachers to do so. She suggests that ICT could help solve this problem through, for example, combining online classes where teachers could bring together children and young people from different schools from the same class level. When discussing what should be changed regarding ICT in schools, stakeholder 2 brings up portability as the devices used in school should be portable and compatible. In addition, she mentions a virtual account where you can log in on any device and still access all your files.

Stakeholder 3 reflects on the idea that teacher education should focus more and more on how to teach the subject together with ICT as well as using the technology together with the children and young people. She does, however, add that she is not sure how much this occurs currently in teacher education. Similar to stakeholder 1, stakeholder 3 brings up the importance of the goal or objective of ICT use (instead of just quantity of use). Another point she finds interesting is that ICT education should combine both technical aspects (the basics of programming, creating a basic program, etc.) and social skills. She considers this important because when learning how ICT and technology work instead of simply being the users or consumers of ICT, one is then able to create content and understand first-hand how the digital world and technology work.

To improve children and young people's digital competences, teachers should try to be up to date with the opportunities that ICT offers. In addition, technical solutions need to be in place and IT specialists in schools could support that. Stakeholder 3 brings up the safety questions in which teachers should be knowledgeable in regard to cybersecurity and children and young people should be taught how to use ICT safely. The safety questions here range from what information and how it should be shared to how to protect the children and young people's and teachers' personal data. In case of breaches, schools should have a code of conduct in place in order to know and be ready for how to solve these issues.

5.4.2. Germany

5.4.2.1. Various perspectives of national stakeholders in Germany

In Germany, interviews were conducted online with three national stakeholders engaged in the DigiGen project, representing different sectors of particular relevance to school development in the context of technological transformations. Within these sectors, stakeholders are the

managing and executive directors and board members in domains ranging from foundations and forums to a centre of media and education in NRW.

The Deutsche Telekom Stiftung (The German Telecom Foundation) is one of the largest educational foundations in Germany, aiming to lead schools into the 21st century (with pedagogical issues in mind). It focuses on the core issue of education, schools, and children and young people, paying attention to future job markets. Committed to improving education, specifically in the subjects of mathematics, computer science, natural sciences and technology, projects are done to equip children and young people with 21st century skills, and to help teachers prepare children and young people for participating in the digital world. With Dr. Ekkehard Winter as the foundation's managing director and stakeholder in the DigiGen project, expertise is added from the foundation's as well as a STEM perspective.

Another foundation that is committed to establishing an environment and educational settings that enable children and young people in Germany to participate in an increasingly complex and digital social life is the Forum Bildung Digitalisierung e.V. [Forum Education Digitalisation]. This organisation is a joint initiative of eight German foundations, including the Deutsche Telekom Foundation. Jacob Chammon represents the DigiGen project as an executive board member of the Forum Education Digitalisation. The Forum Education Digitalisation provides a platform and space for public discussion on the digital transformation within schools and education, with plans for establishing strategy recommendations for the German education system. With Jacob Chammon, not only does the project gain an initiative-based perspective, but further expertise can be drawn from his past experiences as a headmaster, a consultant and a coach for school management and administrators, as well as a trained teacher and published author of didactic books and teaching materials.

With Stefan Drewes as the director of the Centre for Media and Education at LVR (Landschaftsverband Rheinland/The Rhineland Regional Association) in NRW, and as the director of the Media Consultancy NRW, a perspective on didactics as well as psychology is gained. The LVR works to improve care for disabled and young people as well as in the fields of psychiatry and culture. The Media and Education Centre at LVR offers assistance in working with media, using media didactical concepts, developing media projects in educational institutions and much more. As a national stakeholder in the DigiGen project, Stefan Drewes contributes experience and expertise from the perspective of being a director of Media Consultancy NRW, a municipal-state cooperation between regional associations and the Ministry of Schools and Education of the State of NRW. He also brings his experience from his former position as director of the Centre of the State Capital Düsseldorf.

Drawing on stakeholders' input from these different perspectives on the same topic – ICT in schools and how to prepare children for the digital age – the following findings are outlined along the aforementioned key aspects, starting with the key aspects of strengths of ICT in education and teaching and learning with and about ICT.

5.4.2.2. Strengths of ICT in education, teaching and learning with and about ICT

From the interviews with the stakeholders, there is a consensus that technological transformations keep changing society and the economy with a growing impact on everyday life and reshaping the labour market, thereby reshaping required skills for employability in the digital age. In this context, it is emphasised that the implementation of ICT in education prepares children and young people for today's everyday life with digital media, and also enables schools to prepare children and young people for future professions and careers in the 21st century.

Implementing ICT in education, including teaching with as well as about ICT, can offer various opportunities and benefits, which are further elaborated on by the interviewees in different ways. These include increasing children and young people's motivations to learn and participate in lessons as a result of using ICT in schools. Beyond motivation, using ICT in schools can allow children and young people to have more freedom and flexibility and, at the same time, encourage them to develop self-responsibility and self-organisation.

Moreover, as children learn important 21st century skills and become familiar with using ICT through school use, ICT in education offers new possibilities to teach content. Thus, for

instance, computer-based simulation can be used to explain lesson content in a much more comprehensible way, e.g. scientific experiments that would hardly be practicable in a school laboratory. Furthermore, smartphones, which are familiar in everyday life, can also be integrated in schools as long as their potential is reflected upon and used well, e.g. as a physical measuring device in lessons, which can be very exciting for children and young people. However, care must be taken to ensure that digital media are not used arbitrarily, but in a meaningful way in terms of learning processes and preparation for the future.

Furthermore, one strength of educational ICT use, if implemented appropriately, is its potential to enhance educational equity, which has moved to the centre of public discourse on education, most notably with the outbreak of the global pandemic. The stakeholders raise this issue, referring to the impact of the COVID-19 pandemic – including associated temporary school closures across Europe – as highlighting educational inequity in the context of schools' digitalisation processes. The potential and vital importance of ICT, in this context, is emphasised through using ICT in education, discussing how schools and teachers could be enabled to maintain access to education for children and young people even in times of crisis when in-class teaching and learning is not an option.

Educational equity was addressed throughout the interviews and it became clear that, regardless of the crisis period and/or digitalisation in education, educational equity poses a major challenge in Germany. However, in the context of digitalisation in schools, stakeholders state that ICT, if properly used, and implemented pedagogically and didactically, may contribute to greater educational equity, in that ICT can foster more individualised learning and promote an understanding in which not everyone has to perform and reach the same end result. This shall include adapting teaching and learning settings as well as examination formats in which, understanding of teaching and learning has to change which is related to having courage to break new ground to make it possible.

5.4.2.3. Vulnerabilities of ICT in education, teaching and learning with and about ICT

Just as there are strengths and potentials in the educational use of ICT emerging from the interview data, the interviews also reveal vulnerabilities, such as when it comes to children and young people's familiarity with using ICT. In this context, attention was drawn to considering that children and young people are not digital natives, even if they are born into the digital age. The need to strengthen their media competence is emphasised as children and young people would often be familiar only with apps, where they would swipe from right to left, from bottom to top and click on something, when in fact, they would lack digital competence to be able to select and deal with ICT in a reflective manner. It is not enough to provide ICT for everyone, but also guidance and support on how ICT can be used beneficially must be provided, which might not only include children and young people, but also their parents. However, not everything can become digital because then in-person communication would be missing and finding the right balance between both is quite an art. In this respect, the challenge for teachers increases since they are required to manage acquiring and updating technological knowledge, implement educational standards and improve diagnostic skills and knowledge for which children and young people need more support, especially with regards to ICT use, and thus, organise lessons in a more individualised manner while also using ICT.

In this context, it is pointed out that there is an importance in considering the widening gap between less and more advanced children and young people when it comes to their being equipped with digital devices. This was also highlighted during the pandemic as there are some children and young people who were excluded from online lessons due to lacking digital equipment. Moreover, during the interviews, it was pointed out that the effects on the personality development of children and young people have not yet been researched as much. There can be an association between the potential stimulus overload for children and young people and concentration issues. Furthermore, Internet safety is a key issue in the context of vulnerabilities and challenges in ICT use, with the interviews referring to the seductive powers of the Internet and social media along with dangers they would pose, also pointing to the risk of data protection and addiction. Risks and dangers are also mentioned, such as cyberbullying, careless handling of data protection, sexting and the fact that young

people define themselves by received 'likes.' This is of relevance for teaching and learning not only with and about ICT use.

5.4.2.4. Educational policy on ICT in education and the actual implementation considering the relevance of formal transition phases in education

Educational policies on ICT in education and the implementation of ICT in schools

In the context of school development in the digital age, the pandemic has been viewed as a catalyst for creating new perspectives on digital work and increasing political pressure. Still, digitalisation in schools is perceived as a very small-step and not quick enough in a rapidly changing digital age. The interviews with the stakeholders indicate politics' responsibility to ensure that ICT becomes an integral part within educational institutions, with all engaged actors receiving support throughout the implementation process. Support, in this context, was linked to providing digital equipment, but also to providing strategies and support in terms of pedagogy and didactics in the digital era. Stakeholders state that digitalisation processes in schools are still being misunderstood as a mere operating competence by politicians, as being only about equipping schools with Internet and tablets, but not about higher value applications, such as virtual reality.

For Germany, the current situation in terms of implementing ICT in schools is described as still being in the equipment phase, where addressing pedagogical issues and questions regarding ICT use for teaching and learning in school has not even started and it is emphasised that ICT would still not yet be integrated on a structural level as an integral part of all areas of education. In this context, gaps are pointed out between schools across Germany, while the ICT infrastructure and use within schools between individual teachers varies in readiness and willingness to use ICT for teaching. Gaps are not only referred to in terms of teachers' digital competences on an individual level, but gaps are also pointed out between primary and secondary school levels in Germany. These gaps in Germany affect primary as well as secondary education, while relevance of preparing children and young people in primary education for the transition to lower secondary education and leading them towards a more intensive use of ICT is emphasised.

The issue of 'gaps' emerges from the interview data as being central to the context of the COVID-19 pandemic and its impact on education. Challenges are addressed during the interviews, indicating gaps in the system that would hinder providing learning opportunities, and instead increase the risk of learning gaps widening during distance learning phases in times of crisis. Further is pointed out that children and young people would be accused of experiencing learning gaps due to a time when actually adults, educators and the system as a whole would not have been able to provide proper opportunities for learning. This indicates gaps to be present in the system.

Approaches and suggestions for improving the implementation of ICT in schools

> We introduce something, we expect a change in culture, we expect a huge change, but are we feeding into the system what is needed to actually make that change? Time, money, human resources, people. And we expect it to happen without friction. We expect it to happen without anyone being opposed to it. We expect it to happen without making mistakes […] this equation doesn't add up. (German stakeholder[8])

It emerges from the stakeholder interviews that a rethinking and reshaping mindset is essential when it comes to implementing ICT as an integral part of education to prepare younger generations for active participation in a digital society. Attention is drawn to a need for courage to try new ways that include creating a culture in which mistakes are dealt with constructively to tackle problems and foster improvement. In terms of rethinking, it is highlighted that basic skills learned at school, such as reading and writing, should be expanded to the acquisition of basic digital skills as well. This would be the result of having ICT integrated into all areas and spaces in which education takes place, including primary schools and day-care centres.

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8   In the case of Germany, no numbering of the three participating stakeholders is done in order to prevent a direct allocation to named and presented persons.

Throughout the interviews with stakeholders, the topics of teacher training and continuous professional development were predominant and described as being vital for successfully and sustainably implementing ICT in education. Stakeholders outline that it would be only about the people to bring the opportunities of learning with ICT into schools. In this context, attention is drawn to the need of broad measures to reach teachers at different levels of competence, at the level of novices or no-users, i.e. teachers who haven't had anything to do with it yet, as well as those who are already better skilled in the areas. Teachers must be trained and enabled to pedagogically and didactically decide when and how to teach with or about ICT. Although it is pointed out that teacher education is key to move ahead faster, combined with a massive investment in teacher training. Further, it is emphasised that it is not only the teachers who need to be engaged, but the parents also play a significant role in the process of digitalisation. Parents should act as role models regarding the use of digital devices and, while ICT use in school should be increased, they should still be aware and observe their children's screen time.

Thus, it is crucial that not only one, but all groups of stakeholders are involved in fostering the implementation of ICT use in education, considering the importance of the family and the relationship with education.

5.4.3. Greece

5.4.3.1. Various perspectives of national stakeholders in Greece

In Greece, researchers conducted two online interviews with relevant stakeholders using video conference tools. Researchers also contacted a public institution affiliated with the Ministry of Education, but did not succeed in conducting an interview with them. Both interviewees have a research background: Stakeholder 1 is a university professor and Stakeholder 2 is a member of a research centre and an association working on the Internet and children's rights.

Stakeholder 1 has a relatively long history in early education and pedagogy, and has recently been working on inserting new technologies into teaching practices. She is committed to critical research while considering variables such as gender and children's cultural backgrounds. Apart from research and teaching activities, Stakeholder 1 has been involved in consultation procedures with public authorities that are responsible for revising curricula and methods, which she has found to be "a very interesting, but also challenging procedure."

Stakeholder 2 has a technical background, but is also active in a network that promotes safe Internet for children and provides related services and support to parents and children. She has a great deal of experience with parents' and young people's perceptions of the Internet and ICT, in general. While she recognises that there has been quite a bit of progress regarding these issues, even before the pandemic, Greek society and the education system remains behind in terms of familiarity and confidence in using and understanding ICT.

Drawing on stakeholders' input from these different perspectives on the same topic – ICT in schools and how to prepare children for the digital age – the following findings are outlined along the aforementioned key aspects, starting with the key aspect of strengths of ICT in education, teaching and learning with and about ICT.

5.4.3.2. Strengths of ICT in education, teaching and learning with and about ICT

It is generally admitted that ICT in education has various potential benefits for children and young people, but also for teachers. On the one hand, using ICT can increase children and young people's interest and attention, making courses livelier and even playful. On the other hand, it can provide teachers with possibilities to widen the pool of information and thus enrich their educational material.

The stakeholders also share these assumptions. Stakeholder 1 insisted on the need for a better and more systematic incorporation of ICT in the educational process, combining both

synchronous and asynchronous tools of communication. Another aspect was the possibility provided by ICT for a more "play-centric approach," where "the whole learning process, that is knowledge, skills, attitudes and behaviour, can be developed through games and can have spectacular results" (Stakeholder 1). It is a method acknowledged in several contexts, even in cases of children with learning difficulties or disabilities.

On a more general perspective, "transformations in society and in the economy, given the increasing digitalisation that had started even before the pandemic, cannot leave intact education" (Stakeholder 2). Education from the very early stages can provide future citizens with the necessary skills to adapt to and be fully productive in society. School is considered the main institution for preparing children for the digital era, and it can provide them with the capability to protect themselves from potential risks and dangers.

Digital literacy, including both individual and social skills, is and must be an indispensable part of any educational system and learning process: "self-confidence, creativity, problem-solving capacity, critical thinking, adaptability, but also communication and collaboration, cultural empathy, leadership, are things that can be enhanced through the use of ICT in education" (Stakeholder 1).

5.4.3.3. Vulnerabilities of ICT in education, teaching and learning with and about ICT

One of the main difficulties in introducing the extensive use of ICT in education is the lack of preparedness of teachers, not only in Greece but in many countries. Stakeholder 1 referred to a study conducted by the Organisation for Economic Co-operation and Development (OECD) in 2018, where three out of five teachers in the EU were not feeling prepared to use ICT in their teaching practice. This was obvious during the COVID-19 crisis and the imposition of distance learning. "The pandemic functioned as a magnifying glass of pre-existing realities and problems. Many teachers were not prepared to use ICT, while many schools did not have the infrastructure to help their teachers. The result was the confirmation and the reinforcement of the pre-existing digital gap" (Stakeholder 1).

Another aspect the stakeholders mentioned is that of parents, or more accurately, the collaboration between schools and parents. Stakeholder 2 referred to a "lag between school and home," where either different approaches are adopted or work made at school is not supplemented by parents at home, stating that "when we go at schools and we discuss with teachers and children and young people about safety and health issues, this, all this information should be transmitted somehow to parents. It should be transferred to home; otherwise, it is a dead letter" (Stakeholder 2).

In this context, the lack of understanding and digital skills from the parents' side is a factor that hinders children's digital literacy and sustains digital inequalities. According to Stakeholder 2, it is not only a question of material deprivation; it also has to do with insufficient information and knowledge about the potential benefits and harms of ICT.

> One thing is to have a device and access to the Internet; but, even if you have this, it is not certain that children acquire real digital skills, for example to use applications such as Word or Power Point or to learn how to find valid information on the Internet. If they don't have any kind of guidance, it can be very difficult to acquire digital skills and, of course, self-confidence. (Stakeholder 2)

Finally, even if ICT can enrich the teaching and learning processes, face-to-face interaction and embodied experience is considered irreplaceable:

> I have been working for years on digital technologies and education. I fully support the extensive use of digital technologies in education. But this does not mean that other forms of education, more traditional, should be abandoned. It is good to be in the classroom and navigate digitally in a museum, but it is better to go and visit it in person with your teacher and your classmates… If you have the possibility, of course. (Stakeholder 1).

5.4.3.4. Educational policy on ICT in education and the actual implementation considering the relevance of formal transition phases in education

Educational policies on ICT in education and the implementation of ICT in schools

Education and educational policy in Greece are not considered updated in relation to using ICT. A lot remains to be done in order to be in a position to claim that Greek schools prepare children and young people for the digital era. Even the introduction of digital skills as part of the "Skills Workshops," which, according to Stakeholder 1, "proved to be just a different name for the [pre-existing] 'Flexible Zone,'" does not seem to have yet any concrete and tangible results. There are some efforts, mostly some applications, developed and suggested by the Ministry of Education, but it lacks "an overall strategy for the digital transformation of the Greek educational system" (Stakeholder 1). This is not only a question of more ICT use; it is, more importantly, a question of re-adapting curricula and learning tools (the Analytic Programme, as it is called in the Greek context) in a way that encourages and guides teachers to enrich their methods and tools.

In general, education is not an integral part of the National Digital Strategy, and no specific actions related to education are foreseen in large programmes, such as the Greece 2.0 Recovery and Resilience Plan, funded by the European Commission. As Stakeholder 2 puts it, "the bulk of funding and foreseen activities refer either to economy, companies and entrepreneurship, to public administration, e.g. digitalisation of procedures. There is no concern for the education, even though it was one of the institutions that suffered the most during the pandemic."

Another crucial point mentioned is that of teachers' training, which is deemed necessary but is lacking or is not adequate. Most teachers do not feel prepared or that they receive enough support to meet the requirements of a digital transformation in education. Even when teachers were obliged to teach through digital platforms, i.e., during the lockdowns, they became prepared by themselves or were helped by school principals. Stakeholder 1 considered this as an additional point of inequality between public and private schools since the latter were much better equipped and prepared for the transition to distance learning. For teachers in public schools, training effectively started after the lockdowns.

Approaches and suggestions for improving the implementation of ICT in schools

The abovementioned criticism towards policies implemented in Greek schools outlines the suggestions for improving implementing ICT in schools mentioned by the stakeholders. First of all, there is a need for a more comprehensive digital strategy in education, that "will not remain in abstract values and declaration, but it will include specific actions with a specific timeline" (Stakeholder 1). This should be decided after consulting with all relevant stakeholders, i.e. teachers, parents, universities, municipalities, etc.

Secondly, teachers should be more informed and prepared to introduce digital tools in their teaching. This can be fostered by specific training programmes; equally important, however, is to enrich university curricula for teacher candidates with more courses on digital pedagogic methods. There are relevant courses offered in various education departments in Greek universities. It is important, however, to increase this amount and widen their audience, e.g. offer them to children and young people from other departments who will work in high schools or in primary schools as teachers of specialised subjects.

To this end, more specific suggestions were made. For example, Stakeholder 1 spoke about the development of a "Handbook for teachers," which could provide both "scientific guidance and moral support." In this handbook, teachers could find useful material that is developed and tested by other teachers, as well as examples and instructions of effective use of ICT in the classroom.

Stakeholder 2 insisted on the importance of collaboration between the actors who are involved in children's education and upbringing, in general. She suggested that networking between schools, school committees in municipalities and parents' associations should be enhanced in order to discuss matters of online education and safety, and exchange existing good practices.

As both stakeholders believe, ICT is an integral part of – and particularly, children and young people's – lives. Schools should not remain in the pre-digital era if they want to remain relevant for children's lives and futures.

5.4.4. Norway

5.4.4.1. Various perspectives of national stakeholders in Norway

In Norway, researchers conducted online interviews using video conference tools with three national stakeholders engaged in the DigiGen project. These three stakeholders represent different sectors that are relevant to DigiGen. One of the stakeholders is from national education authorities (stakeholder 1), one is from the local/regional education authorities (stakeholder 2) and one is from a national youth organisation representing children's rights and interests (stakeholder 3). Each of these stakeholders brings in a unique perspective on the role of ICT in education.

Stakeholder 1 has extensive experience in both national and international policy on ICT in education, and has recently worked with a knowledge base related to digitalisation in school and education, in general. There are several different actors in Norway who are working on ICT policy. For instance, stakeholder 1 refers to the work of the Ministry of Education (KD), which operates on two fronts,

> one with curriculum development where KD has been the main driving force through the introduction of the fifth basic skill, digital skills. The second front is related to infrastructure, which has been most evident in recent years. This second area includes a rollout around service design and learning resources, which serves as the underlying work to try and create some kind of framework conditions for teachers, school leaders and school owners to educate children and young people to achieve the digital skills that are now a part of the national framework for basic skills. (Stakeholder 1)

The Ministry of Education works in close collaboration with the Directorate of Education, which is responsible for all national statistics and the development of kindergarten, primary and secondary education.

Stakeholder 2 has, as the main task, to work with "national authorities to contribute to good digitalisation as related to the upbringing and education of children and young people." According to this participant, the organisation is

> tasked with being the municipal sector's spokesperson and representative to the state authorities when it comes to digitalisation, in general. It is enshrined in a national strategy for digitalisation in the public sector, in a digital public sector, and this means that the organisation is a representative in national forums and meetings and councils and committees and also occasionally uses its members as representatives in these forums and meetings. (Stakeholder 2)

Stakeholder 3 is a representative of a national youth organisation in Norway and is involved in volunteer work, mainly in the area of ICT and how volunteers can improve their use of digitalisation. This was extremely important during the pandemic in order to enable people to continue their volunteer work. Stakeholder 3 aimed to make sure that "people learned how to use Teams and Zoom and to know what was needed in a way to have an online activity." This stakeholder's overall concern pertains to issues of diversity and inclusion within the digital ecosystem. As a female gamer, her insights have been useful in her work within the organisation, but also for previous volunteer work with children and youth organisations that engage in computer games, role-playing games and board games.

Drawing on the stakeholders' input from these different perspectives on the same topic – ICT in schools and how to prepare children for the digital age – the results of the interviews are organised around these areas: strengths of ICT in education, the challenges faced, and reflections on implementation and policy.

5.4.4.2. Strengths of ICT in education, teaching and learning with and about ICT

Through the interviews with the three Norwegian stakeholders, it was clear that the commitment to digital skills and competence has been an important development in Norway. The fact that digital skills are one of the five basic skills was seen as crucial in contributing to teachers' and school leaders' emphasis of ICT in schools. However, due to the outbreak of the COVID-19 pandemic, the pedagogical potential of using ICT in education became quite clear. Stakeholder 2 describes this as follows:

> In Norway, we had a big boost through the pandemic because many have tried things they have not tried before, and they were forced to do so. Many discovered a certain pedagogic potential in using digital tools and using teaching methods that are adapted to digital platforms. (Stakeholder 2)

Stakeholder 1 also shared a similar belief of the pandemic's positive influence on using digital tools. This positive use brought about increased opportunities and a greater focus on the potential of ICT, as well as its importance for education, in general. Through the increased and perhaps even forced use of ICT, the stakeholders agreed that educational institutions have benefitted by gaining insights into what kind of learning processes are taking place and what opportunities exist with technology.

A commitment to digital skills rooted in the new curriculum reform (LK20) allows children to develop these skills across a variety of subjects and cross-cutting themes, such as democracy and citizenship. Including digital competence across all subjects and cross-cutting themes helps children and young people to develop good digital responsibility. Yet, the stakeholders point to the important role that teachers play, and that they themselves would need sufficient competence to show children and young people how to become competent digital citizens.

A few important topics came up in the interviews, including the link between home and school; digital skills important for children and young peoples' lives in and out of school, now and in the future; and how schools can make better use of the interest areas of children and young people they know from their leisure activities, such as online gaming. These issues point to the importance of the digital ecosystems that children and young people interact within, but that also affect them. One of the stakeholders is of the opinion that the increased recognition of children's rights and participation in society, including their digital rights, has increased in recent years. However, this is an area that needs further attention in terms of developing democratic understanding and the children and young people's abilities to also feel that they have opportunities through digital media. According to stakeholder 3, the increased inclusion of games in education may motivate children and young people and increase the inclusion of those children and young people who may be at risk of dropping out of school.

The importance of educational equity was a topic that all stakeholders discussed in one way or another. On the one hand, stakeholder 2 mentioned this in relation to the home-school collaboration that became even more obvious during the COVID-19 pandemic:

> You have to look at how the learning arena is also influenced by the digital and different groups of students with some doing well and others not…The school has a greater social mandate than just teaching math, for example. So, abruptly there were a number of issues that are drawn into the cooperation between the school and home that may not have been so clear before. (Stakeholder 1)

In addition to the cooperation between home and school becoming more apparent, "parents were given a greater insight and understanding of what both types of school days, in general, are like, but also that digital learning can bring opportunities" (Stakeholder 2). Educational equity has to do with the fact that schools can serve as an important equaliser in terms of access to technology, a vital lesson learned through the pandemic, as well as the understanding that "not everyone has the same starting point" or similar support from their home environment (Stakeholder 3).

5.4.4.3. Vulnerabilities of ICT in education, teaching and learning with and about ICT

While the DigiGen project has aimed to highlight the opportunities of ICT, the stakeholders are also aware of the challenges and vulnerabilities that exist. First, they all recognise the general challenges involved with introducing ICT in education, but they feel that these can be reduced if this is achieved through a carefully planned process.

Our stakeholders point to the essential need for educational and training institutions, for both children and teachers, to focus on digital competence development and skills training. This is particularly important in order to promote inclusivity and participation in the digital environment, as well as to avoid the risk of widening the educational divide between children from advantaged and disadvantaged groups. This risk of a digital and educational divide was, according to the stakeholders, something that became more visible during the pandemic. Moreover, the recognition that not all children and young people have the same starting point when it comes to differences in use and access to the digital ecosystem became even more apparent. Thus, the access gap between children and young people can increase when it comes to digital devices. The fact that not all (particularly, primary) schools in Norway provide 1:1 technology meant that schools and counties had to scramble to provide children with devices during the pandemic so that they would not be excluded from online lessons due to the lack of devices and relevant software. Yet, as stakeholders 1 and 3 pointed out, access to the Internet and technological devices is just a start. Home environments may still not be conducive to learning as the household may consist of many children, all of whom may need help. Parents that are unable to assist their children with school or homework, due to their own work commitments and where there may be little or no private space to learn, influence the opportunities that children received during the pandemic. Thus, online education may be challenging for the least prepared children and young people, which can have several reasons apart from those mentioned. These children and young people risk performing worse in an online setting than they would in the face-to-face classroom, and thereby increase already existing exclusion. The carefully planned process of introducing and using ICT in education needs to consider such issues, and as stakeholder 1 pointed out:

> It's not simply about technology use. We need a school that's getting better and we have to create a school that motivates kids to learn and to become digital responsible individuals. I really think that what technology you use to get there doesn't really matter, I think that it's smart to use some digital technology because it's going to make kids prepared for a lot of the jobs in the future and it's smart of us to train them to be critical users of the Internet...Yet we still need a serious discussion around digitalisation and what it means for learning. (Stakeholder 1)

Other issues brought up in the interviews revolve around privacy and online safety. While the Internet and online games, for example, are a "great way to talk to your friends...and make friends online, there are issues connected to the need to protect people's privacy" (Stakeholder 3). One of the stakeholders asked, where that boundary would stand and where to stretch it. While this is related to the individual level, stakeholder 2 suggests that the privacy issue can also be seen at the school and county levels:

> The use of technological solutions [apps. or software] that are not intended for use in teaching and in schools, where teachers and schools may also have created users for their students, means challenges in terms of privacy issues and information ends up in places where it should not end up, and they [the schools or school owners] may not think about the consequences of it. It may seem a little harmless, but we also, unfortunately, have examples of how it has had adverse consequences. (Stakeholder 2)

Thus, the need to consider privacy and safety issues from an individual point of view as well as at a school and municipality/county level, is still something that needs more discussion as well more developed safety frameworks on how to achieve this. Ultimately, the school is tasked with safeguarding children and young people's privacy, but it is clear from the interviews that the public sector and the government need to have a plan in place in the event of further school closures in the future and with regard to new and emerging technology, such as the use of artificial intelligence (AI).

Becoming good digital citizens also means that schools, together with parents, need to focus on safety in terms of digital education to contribute to positive experiences and online participation. For the stakeholders, the need to also provide teachers with professional digital competence is critical as they need to be able to talk about these issues and use learning resources that are relevant to these topics. Themes that can become even more important in the future are ID theft and privacy, requiring particular attention:

> But also, safe digital upbringing and the strategy needs to consider that there are more people working in a school, adults working with children, employed in after school programmes, kindergartens, public health nurses in particular, that they should have up-to-date expertise on this issue. Even those who work in youth clubs and other after school environments. So there is something about strengthening the general competence among the different agencies and actors. Now we can't leave this to the parents alone. (Stakeholder 2)

5.4.4.4. Educational policy on ICT in education and the actual implementation considering the relevance of formal transition phases in education

Educational policies on ICT in education and the implementation of ICT in schools

Viewing educational policy on ICT in education, stakeholder 1 claims that:

> Digitalisation is an area that many political officials like to bask in when things are going well. Yet, they are not very fond of allocating money for it… So, while digital skills are one of the basic skills, we have been a bit mechanical about how digitalisation is managed in policy documents. We have focused a lot on learning outcomes but less on the conditions around children's upbringing or a kind of digital upbringing (bildung)…I think this topic will become more important from a policy perspective in school development, and I hope it will improve in the years to come. However, there is still not enough research compared to other parts of education and how it contributes to policymaking. (Stakeholder 1)

Thus, it is essential for this stakeholder to focus on digital upbringing "bildung" or in a similar vein to what researchers in DigiGen have referred to as a kind of digital responsibility. Moreover, the stakeholders state that projects such as DigiGen and others are important for providing input to the policy arena. While there is no national white paper, there was a digitalisation strategy (2017–2020) and currently an Action Plan (2020–2021) that focuses on digitalisation in basic education. The main themes of the plan include: 1) access to digital learning resources; 2) privacy and safety issues, including a focus on student data; 3) digital competence for school owners, school leaders and teachers; and 4) a section on the knowledge base for digitalisation in school, which focuses on the need for more research and some brief recommendations of how to move forward.

Our stakeholders pointed at the need to coordinate efforts at the national and local levels. Thus, there is a need to see digitalisation in education in within the scope of overall strategies and plans laid down and the investments being made. Integration into the overall policies and initiatives needs improvement. At the same time, there is a need for a digitalisation strategy at the school level, including the infrastructure and the more technical aspects as well. While this need was brought up during the stakeholder interviews, there is awareness of plans in place to develop a new national digitalisation strategy for digital competence and infrastructure for kindergarten, primary and secondary education. The strategy is being developed in collaboration with the Ministry of Education and the Norwegian Association of Local and Regional Authorities (KS). Plans are in place to present this strategy by December 2022.

Approaches and suggestions for improving the implementation of ICT in schools

Our stakeholders pointed out the need for more research like the DigiGen project. According to them, the kind of research provides which will be important in the future For them, these insights are essential for laying the foundation for how to design policy for school.

> How to translate policy into practice is a big challenge. One thing is for the researchers to know this or that for government officials, another thing is how should this actually be carried out in the thousand classrooms. Here we have a long way to go. (Stakeholder 1)

When asked how they think this research will bring about transformation in educational practice, one of the stakeholders pointed to the need for the Directorate of Education (Udir) to be clearer in recommendations provided and perhaps, more informative.

Another area of concern for the participants is that of teacher education and how to better prepare "the future generations of teachers in digital didactics, in thinking about digital possibilities and around issues such as privacy and online identity formation among students. These are really the tools that we mostly have now" (Stakeholder 1).

More practical solutions from the stakeholders also involve thinking about the actual classroom practice and use of ICT in new and creative ways. Stakeholder 3 describes it as follows:

> You can use a little more of the 'game knowledge' that exists. You don't have to have a game for everything, but create something that helps, for example, those who are about to drop out. Or if you use computer games, for example, with people who use computer games to escape from school because they are... eh they don't master it, something like that then. That one can also use it for a hope to catch those who need it and all this. I'm just very positive about video games, but I also see that they have a very positive [learning] effect. (Stakeholder 3)

One final issue that all stakeholders agreed on was that using ICT in education needs to be carefully planned, and the technology's pedagogical and learning aspects should be considered. The big question is: how is integrating technology into the curriculum beneficial? However, in the end, it has to be considered:

> The long-lasting consequences...I don't know...that perhaps more people think it is okay to have online teaching that one expects it in the future....I think it's a separate value to come to a school and sit in a classroom, but online teaching may be reserved for such special situations, such as being ill... ...or having a disability that prevents you from coming to school, something occasionally or something along this direction. (Stakeholder 3)

The importance of face-to-face teaching cannot be overlooked, but as the stakeholders have pointed out, ICT is here to stay, so there is a need to understand how best to use it. Thus, emphasis is put on harnessing ICT's pedagogical potential for teaching and learning to ensure that all children and young people have the same opportunities and for optimising every children and young people's learning outcomes.

5.4.5. Romania

5.4.5.1. Various perspectives of national stakeholders in Romania

In Romania, interviews were conducted online with three national stakeholders engaged in the DigiGen Project, representing different sectors of particular relevance to school development in the context of technological transformation. Within these sectors, stakeholders are active as managing and executive directors and board members in domains ranging from NGOs to an industry provider (i.e. providing software and tools for assessing digital literacy and competencies).

Irinuca Văduva is the General Manager at ECDL Romania (European Computer Driving License),the world's largest IT certification programme for basic computer skills for end-users. It is recognised worldwide in over 100 countries. The ECDL/ICDL certificates offer their holders the guarantee of having the necessary basic IT knowledge for assuming an active role in e-Society. There are several main products within the ECDL product range, from ECDL EqualSkills at entry-level to specialised and professional programmes for IT practitioners (ECDL Advanced). The ECDL Romania is the only entity authorised by the ECDL Foundation and ATIC to promote and develop the ECDL concept in Romania. The ECDL Romania developed a national network of

approved test centres, which is currently in full development and will cover all country districts. At this moment, there are over 800 test centres. The centres list includes educational institutions (universities, high schools, and even secondary schools), training centres within the structures of administration and centres for vocational training in all of the cities in the country. Irinuca Văduva brings in her expertise in assessing digital literacy and competencies as well as her knowledge about schools' readiness in integrating digital tools in the learning process.

Anca Velicu is a researcher at the Institute of Sociology of the Romanian Academy and a founding member of the platform, Digital Lives, Research, Education, Innovation (NGO). Over the past years, she has been involved in projects related to using ICT in early childhood within the family. Her last projects are Kids' Digital Lives in Covid Time (KiDiCoTi), coordinated by the JRC - the Joint Research Centre of the European Commission; Makerspaces in the early years: "enhancing digital literacy and creativity" (MakEY, dir. J. Marsh), and the COST Action "The Digital Literacy and Multimodal Practices of Young Children" (DigiLitEY, dir. J. Marsh) project in which she was a co-manager for the relationship with stakeholders. Anca is involved in civil society as a board member of the National Consulting Committee for Ora de Net (Save the Children Romania). She brings a sociological perspective to the DigiGen project as well as her expertise in working with families with small children.

Ileana Rotaru, PhD, is an Associate Professor at the West University of Timisoara, Romania (Department of Philosophy and Communication Sciences) and PhD supervisor in Communication Sciences. Her research has focused on the transdisciplinary fields of communication sciences: children/youth and media; ICT usages; Internet effects and digital inequalities; fake news; virtual communities and cultural identity in multi-ethnic social environments, especially of Roma descent; digital citizenship, and media education. Her latest research and publications are focused on anti-gypsyism and online hate speech and educational policies concerning media education in Romania. She is an external expert for Save the Children Romania (responsible for training programs in media literacy), the European Roma Grassroots Organisation (ERGO) and different nongovernmental national organisations. She is a member of the European Communication Research and Education Association (ECREA) and an expert member of the Romanian Ministry of Education Special Commission for continuing professional training programmes.

Drawing on stakeholders' input from these different perspectives on the same topic – ICT in schools and how to prepare children for the digital age – the following findings are outlined along the aforementioned key aspects, starting with strengths of ICT in education, teaching and learning with and about ICT.

5.4.5.2. Strengths of ICT in education, teaching and learning with and about ICT

From the interviews with the stakeholders, there is a consensus that ICT have enormous potential for fostering the imagination, autonomy and creativity of children in the context of their education (and beyond), but involving teachers and parents is paramount to realising their potential.

The national stakeholders seem to agree that, in general, the state has done little to integrate digital tools into the educational process in a meaningful and sustainable way. Nonetheless, mobilising the NGO sector, some schools, and dedicated teachers in ensuring children's access to ICT and use for school purposes and education continues to be crucial in this context.

The COVID-19 pandemic has exposed the holes in the education system by reinforcing existing inequalities (benefitting the already well-offs and leaving behind the most marginalised). They do, however, note the creation of a national platform for schools, but are sceptical about its continuous usage after the pandemic. There were efforts made to supply ICT infrastructure to schools/teachers/ children and young people in the context of COVID-19 distance learning, but this did not benefit everyone.

In contrast, the stakeholders noticed very good organisation for schools dedicated to children and young people with special needs, especially through the positive coordination between parents and teachers. On the other hand, there was poor inclusion of SEN[9] children and young

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9   Special educational needs

people at public schools because no one had time for them during COVID-19, as opposed to very good inclusion of children and young people at all-SEN schools.

Furthermore, when it comes to ICT, the school curriculum is satisfactory, but needs to be supported by qualified human resources. Digital manuals, if of good quality, can be a cheaper alternative to expensive books/manuals.

With regard to innovation, there are some being made in the way that teachers integrate digital tools in their educational process, e.g. 3D design and printing, robots, VR. In general, there is a need to integrate the child's own interest in the learning process, using ICT.

Many teachers have demonstrated willingness and openness to learn about ICT, but most of them are left unsupported, on their own, and limited by their own individual effort and resourcefulness. As a solution, stakeholders suggest that schools should put more pressure on authorities to receive equipment and updated software (but sometimes they do not care about these things).

In order to understand how society functions in Romania, one must pay attention to cultural differences, as one of the stakeholders stated. Romania is not the country of rule-abiding people; people are used to things not working, circumvention and managing on their own. This type of environment, overall, maintains a general feeling of distrust in authorities, preventing many from taking steps towards communicating what is perceived (sometimes, rightfully so) as being unhelpful to authorities.

5.4.5.3. Vulnerabilities of ICT in education, teaching and learning with and about ICT

In general, stakeholders agree that the pandemic has deepened inequalities (urban/rural; privileged/underprivileged), with the government leaving behind those in precarious situations. Usually, the rural areas are serviced by under-prepared teachers or teachers with the lowest results in their scores at the national exams.

When it comes to teachers, many fear technologies and generally, there is a huge gap in understanding and openness between generations. Some are defaulting to superficial uses of ICT (e.g. copy/paste from online resources), which can be disastrous for children's education (lack of motivation, stifling creativity). One stakeholder mentions the use of ICTs for school, only for documentation and collecting information, or for projecting the physical manual on a screen. This is limited, with very little understanding of digital citizenship, digitalisation, skills, risks, etc., with no creative uses and no innovation. Focusing only on bad stuff in all matters concerning digital education, e.g. privacy, security, with no attention to creativity, e.g. integrating digital graphic design in arts/crafts schools and high schools, is another shortcoming the stakeholders noticed.

Other teachers are unwilling to ensure the quality of hybrid teaching, which furthers disadvantages kids that have to attend classes from home. As a result, some children have been left behind, left struggling rather than benefitting from ICT. For many children, the learning process was turned into an activity of ping-pong delivery of request/task between the teacher and the child or young person.

Usually, in the beginning of the pandemic, the ICT teacher was mandated to create a webpage, and teachers were left alone to handle their online learning spaces and how they communicate with the children and young people (some had access to a dedicated national platform). However, how many of them benefitted from public resources was a matter of the skills and willingness of teachers to engage with ICT.

Furthermore, stakeholders notice big discrepancies between dedicated teachers in primary schools who embrace ICT, but in the transition to 5th grade, where children and young people have more different teachers, some of them are not using digital ICT, which might be a missed opportunity for some children and young people.

5.4.5.4. Educational policy on ICT in education and the actual implementation considering the relevance of formal transition phases in education

Educational policies on ICT in education and the implementation of ICT in schools

Overall, stakeholders note the lack of coherent, sustainable strategies for integrating ICT in education, just some "patching" here and there, e.g. limited support for vulnerable groups (there is no point in giving them tablets if there is no Internet access or no electricity in many rural communities). On paper, however, Romania seems to be compliant with European regulations and directives. "We have very fancy things in terms of policy, but extremely poor implementation" (Romanian stakeholder).[10]

One stakeholder mentions the poor quality of teaching/learning during the online schooling phases, as 40% of Romanian schools do not actually have access to technology. During the pandemic, many teachers were learning on their own, on their own time, unsupported, with no systematic continuous preparation/support in acquiring digital competences.

Moreover, educational policies are not connected to digitalising the labour market and jobs. This is the result of formal education of ICT in schools being completely disconnected to actual competences that young people might use in future jobs (e.g. many children do not learn to use MS Office - Word and PowerPoint).

In general, the authorities have a history of poor collaboration with other stakeholders. For example, researchers should be co-opted in developing policy, while schools could invite researchers/industry representatives to talk to parents and teachers about ICT.

However, forcing measures is not the solution (e.g. compulsory courses for teachers or classes in undergraduate system). More coherent strategies are needed in order to support schools and teachers. There is a need for a coordinated media education programme for teachers in the undergraduate system, and a need to integrate transferable digital competences for teachers, including those related to media ecology education.

Overall, stakeholders identified the following needs in relation to educational policies:

- The need for coherent, coordinated and sustainable strategies and measures, not just mere "patching of the holes" in the system;

- The need for comprehensive research on the effects that the pandemic had on the education system;

- The need for educational policies to be connected to the digitalisation of the labour market and updated jobs;

- Better implementation of fancy policies; for example, the Strategy for Digitalisation in Education was poorly implemented, externalising everything to NGOs. It was not at all adapted to the national context. Another major drawback was renouncing to invest in experts that were capable of collecting and analysing data on the implementation of the Strategy;

- The need for a unified database to centralise all educational resources;

- The need for updated curricula and manuals (one stakeholder saw an ICT manual with a tube display and a floppy disk, but many children have no idea what a floppy disk is); and

- Integration and support for NGOs that are left alone and under-supported in assisting underprivileged areas and communities (NGOs that rely solely on the sporadic/inconsistent funding they manage to attract).

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10   In the case of Romania, no numbering of the three participating stakeholders is done in order to prevent a direct allocation to named and presented persons.

5.4.5.5. Approaches and suggestions for improving the implementation of ICT in schools

The stakeholder interviews expressed that schools are an important element in integrating digital tools in the learning process. However, stakeholders note some facts that are currently holding back the implementation of a digital curriculum, namely:

a) There is a rather poor understanding of what online schooling means. Many schools simply returned to the "before" pandemic period, with the same antiquated ICT labs/classes (and no other integration of ICT), when they were able to return to school in person;

b) Many poor schools keep their ICT lab closed because they did not have teachers qualified to teach ICT, while good schools have their labs full all the time (digital divides overlapping with the socioeconomic divide); other schools kept well-equipped labs closed so the equipment would not break; and

c) There was no inclusion of dedicated video cameras in the online or hybrid schooling. Some problems included very poor video and audio quality, quality of the transmission, no connection between classmates, no connection between some children and young people and teacher in many cases, etc.

With regards to implementing ICT in schools, stakeholders propose:

- Supporting teachers in managing the "enforced digitalisation" that occurred with the COVID-19 pandemic (there was an extreme rejection of technology before 2020 among Romanian teachers, with very few exceptions);

- To invest in human resources and for schools/school districts and government to take responsibility and support the teachers;

- In addition to investing in human resources (teachers), it is extremely important to provide counselling for parents, teachers and children with regards to ICT in order to understand their potential and risks;

- Schools and teachers should accept the idea that ICT is a necessity. This requires long-term sustainable policies of integrating digital tools into education (not just as a patch for the pandemic situation, and then reverting to not really using them);

- Providing IT equipment and infrastructure to all schools in Romania, bridging the digital divides; and

- Extending the courses accredited by the Ministry of Education in International Certification in Digital Literacy to a larger number of schools (now, the number is limited).

Thus, it is crucial that actual implementation of policies and assessment of their implementation takes place in order to ensure the actual digitalisation of education.

6. Relevance of results to policy and practice

As the European DigiGen project aims to contribute to new ways of improving ICT-related policies on the European level, in this chapter, research results on ICT in education, as presented in Chapter 5, are discussed in terms of relevance to policy and practice (**Section 6.1**).

In particular, aspects dealing with the conditions contributing to children and young people benefitting from, and being negatively impacted by, the use of ICT are considered. Subsequently, the relevant results for UN SDGs are discussed (**Section 6.2**).

This is followed by a discussion of the relevance of the results for best practice (**Section 6.3**). In this context, the focus is on good practices for children and young people, for teachers and for policy makers.

6.1. Relevance for EU policy use

In examining how children and young people view their education in terms of preparing them for their future lives in a digital age, it is also a question of identifying strengths and weaknesses of ICT in education. This is also referred to as the beneficial and harmful aspects of ICT in education. Thereby, there are indicators and characteristics on three different levels – the individual background of the children and young people, the teacher level, and the school level – that are classified as beneficial or harmful in this context. These indicators and characteristics reveal a relevance for EU policy use to support beneficial aspects and prevent harmful aspects in the context of ICT in education.

6.1.1. Children and young people level

At the level of children and young people, beneficial aspects can be identified that reflect ICT strengths in education. One aspect is the potential of Internet use to help children and young people learn more on their own and find answers beyond textbooks. This can promote autonomy while also enhancing flexibility and motivation to learn at the same time. In this context, video platforms offer learning material that goes beyond the school material. This includes, on the one hand, links provided by teachers and, on the other hand, videos that children and young people search for themselves in the sense of self-education. Beyond research and consumption, digital content creation offers potential for promoting imagination, autonomy and creativity. In terms of promoting individual learning, learning apps enable children and young people to assess their own performance and identify weaknesses that need to be improved.

In addition, most children and young people emphasised the benefit of having school-related materials stored and available in one place, referring to learning management systems and school clouds. In some cases, this would also include digital devices that are owned or provided by schools, as well as the frequently mentioned ease of carrying heavy materials. In the context of social inclusion, ICT use enables children and young people to network with each other and with teachers.

In the five participating countries, several harmful aspects could also be identified.

One of these aspects is differences in access to digital devices available at home to do homework, engage in school networks or participate in (pandemic-induced) distance learning. These differences can increase the risk of children and young people falling behind, not only in learning but also in socialisation. Due to the distance learning periods caused by COVID-19, the risk of desocialisation was particularly evident from the data from all participating countries. The children and young people expressed a desire for face-to-face contact rather than online-only interactions. In this context, children and young people also reported the risk of cyberbullying and social exclusion, in general, because of things like a lack of devices and Internet, lack of skills or lack of permission to use ICT, and because they were not invited to class chats and groups on messenger.

Another issue raised in all participating countries as pertained to Internet safety relates to the risks of an online virus, becoming a victim of a hacker attack and data protection violations, especially in relation to using social media. However, many children and young people are also aware of the possible physical effects or have even experienced how excessive ICT use and screen time can lead to fatigue or even eye- and headaches.

Lack of digital skills can prevent children and young people from using the full potential of the various ICTs available, such as digital books for school. The availability of the Internet or leisure apps on digital devices is also perceived as a challenge, as it creates great potential for distraction on digital devices with available Internet and leisure apps, which can be challenging for learning.

One issue that was addressed, especially during pandemic-induced distance learning, was that children and young people do not appreciate when too many (and different) digital solutions are used. Instead of helping them, an excess of digital solutions creates confusion and unnecessary stress. Therefore, when using ICT in education, the aim cannot be in offering a lot of different applications and solutions, but to work more profoundly with few ones.

6.1.2. Teacher level

At the teachers' level, a beneficial issue can be identified as enabling them to work with a variety of appealing materials and methods in the classroom. Teachers' organisation and classroom management were also mentioned as a strength of ICT, as lesson plans and results can be documented and stored for easy access for years to come, which can be seen as smart and sustainable work. Frequently mentioned benefits also refer to ICT as a time-saving tool for teachers and teaching, provided that the technology works properly, especially the Internet connection.

However, various harmful and problematic factors can be identified at the level of teachers. These include differences in understanding and openness to school ICT use, both between individuals and, according to children and young people, between generations and subjects. In addition to attitudes, digital skills and confidence also differ between teachers, making teaching with and about ICT more difficult and thus affecting children and young people's preparation for the digital age. In this context, reluctance to use the potential of ICT because of a lack of the necessary know-how, especially in relation to data protection, makes teachers vulnerable and limits their willingness and ability to use ICT's potential in school and in the classroom.

6.1.3. School level

At the school level, the effort and strategies to provide schools with ICT infrastructure, especially in the context of COVID-19-related distance education, can be highlighted as a beneficial aspect. Digitally advanced schools, where every teacher and every child and young person is equipped with school devices and ICT is an integral part of daily teaching and learning that promotes ICT inclusion, emerge as being particularly beneficial.

Differences in IT equipment and infrastructure can be highlighted as a harmful issue at the school level. This can result in teachers not having the same opportunities to teach with and about ICT, and thus not have the same opportunities for children and young people to work digitally, learn about ICT and develop digital skills.

The lack of systematic, continuous development/support for digital literacy acquisition among teachers and gaps between strategies and their implementation can also be identified as harmful aspects of ICT in education. In this context, bureaucratic requirements increase vulnerability as, for example, some disadvantaged children and young people could not be equipped with digital devices fast enough to participate in pandemic-induced distance learning.

One core message that emerged from interviews with teachers and the national stakeholder members is that everything starts from home and ends at home. It is seen as the parents' responsibility to create a comfortable and supportive learning environment at home and provide emotional and technical support for their children and young people. This extends the limits of educational policies in the EU and, therefore, could be seen as part of family policies.

Furthermore, regarding policy, better evaluation is needed for implementing policies. As shown by multiple stakeholders, for instance, Romania seems compliant with adopting EU regulations, but better monitoring of their implementation is required.

Overall, it appears from the numerous beneficial and harmful aspects, that there is potential for development in all participating European countries. It is also clear that various adjustments should be made at the EU political level in order to support beneficial aspects and prevent harmful aspects in the context of ICT in education.

6.2. Relevance for UN Sustainable Developmental Goals

With beneficial and harmful aspects in the context of ICT in education, the UN SDGs can also be linked. As described in Section 2.5, 17 SDGs are focused on in the framework. Five of these are particularly important for DigiGen's focus area 'ICT in education'. These are: (3) good health and well-being, (4) quality education, (5) gender equality, (8) decent work and economic growth, and (10) reduced inequalities.

The results show that it is important **to ensure** schools have **adequate IT equipment and infrastructure**. This includes providing IT equipment and IT infrastructure that goes beyond hardware, but includes software, licences as well as support for integrating ICT and harness the potential. It is also important to include digital learning materials and provide access to learning management systems for schools and all children and young people. Furthermore, an enrichment of educational tools incorporating digital skills acquisition is needed. This aspect addresses SDGs (4) and (10). In this context, SDG (4) can also be achieved with more accessible classes and courses (e.g. distance learning settings, online courses from other schools and universities, etc.) via distributing study materials and videos explaining different topics, etc., but also to ease communication between children and young people, teachers and communities in the education field.

Another important aspect is to **involve all children and young people equally in school digital learning**. In this context, the importance becomes apparent. There is a special focus on including children and young people from disadvantaged backgrounds. Furthermore, additional support (financial and personal) should be provided to schools with challenging student backgrounds. The SDGs (4), (5), and (10) are addressed. Currently, some social groups (e.g. elderly people, people who lack ICT competence) are experiencing exclusion from services and products available online, resulting in more inequalities compared to those to whom these services are available. To provide an example, in Estonia, most common bank services are available online and do not require travelling to the bank office. Yet, if one does not know how to use these services online, he or she cannot benefit from it as the others do (e.g. saving time from travelling, avoiding travelling costs, etc.). A similar line of thought can be seen in other services and accessing information. Therefore, providing all social groups with strong ICT competences would reduce the inequalities currently existing between social groups.

Further, a **student-centred approach to digital learning in teacher education** should be embraced. Here, emphasis is placed on collaboration and co-creation (as a two-way communication). Student-oriented and future-oriented digital learning from children and young people's perspectives in teacher professional development is important, as well as acknowledging vulnerabilities and strengths of ICT in education. In addition, there should be coordinated national efforts/guidelines developing teachers' digital competence. The SDGs (3) and (4) are addressed. Regarding good health, skilful use of ICT supports the spread of correct information (as opposed to disinformation, e.g. the unscientific viewpoints for vaccines, COVID-19 disease, etc.), and therefore helps to provide guidance in health behaviour. A similar line of thought can be found in relation to ICT and well-being. In addition, meaningful interactions can be supported by ICT use by participating in (online) communities and supporting ones' feelings of belonging. Instead of focusing on the harmful aspects of ICT use (addiction, too much screen time, etc.), ICT should also be seen as a means to support one's good health and wellbeing.

The SDG (4) also addresses the need to rely on participatory manners of learning and school improvement processes. This means integrating all children and young people in a participatory

way in shaping their learning and school development in the digital age. There is also a need for further and better elaboration, including producing new material and using innovative methods.

Similarly, SDG (2) is addressed by making use of democratic and student active digital learning approaches in a future-oriented school culture. This means integrating all children and young people in decision-making and developments, and using new forms of digital participation as well as using the potential of ICT for personalised learning and individual support. Related to SDG (4), SDG (8) can be achieved when education provides preparation needed for working life. This includes skills and competences (including ICT competences) needed in the future. As the world becomes more digital, the occupations become more digitalised. For people to manage well in their workplaces, ICT competences need to be taught in schools.

It is also crucial to **put effort in digital responsibility and support it** with **school learning**. What is more, it is essential to work with children and young people on digital responsibility starting from an early age. This should not just focus on being critical of sources, but also other aspects (e.g. responsible online behaviour, aspects of digital bullying and online harassment, algorithms, cookies, privacy issues, copyright, etc.). Investment should also be made in the human resources regarding ICT in order to understand the potential and the risks. The SDGs addressed are (3) and (4).

Another important aspect linked to SDG (4) is to **support teachers' transformative digital competences** and provide support to the teachers' agency in their professional practice, determining how they need to be flexible and able to adapt to new technologies. In addition, it is important to foster in-service training for teachers and communities of practice within schools. Also, professional development should be supported as a general competence that is overarching throughout subjects. It is likewise important to support a clear school leadership dedicating time to ICT training and courses to raise teachers' digital competence. Throughout the interviews conducted with children, teachers, and stakeholders, it was apparent that it was vital to ensure quality access to all children, invest in the digital capabilities of educational staff and foster digital literacy at all levels of the education system.

Another key aspect related to SDG (4) is the development of **teacher collaboration and a culture of sharing**. Opportunities should be created for teachers to exchange, to share practices and co-create teaching material. Such opportunities not only require digital devices and programs but also time dedicated to collaboration. It is also important to establish training sessions and equipment to work together and develop new ICT practices. Beyond that, there is a need for a unified database to centralise and share all educational resources.

6.3. Relevance for best practice

This concluding chapter is dedicated to outlining the relevance of research results presented in this working paper for best practice. It combines, on the one hand, which beneficial and harmful aspects there are in the context of ICT in education and what relevance this has for EU policy (see **Section 6.1**), and, on the other hand, which goals and SDGs should be pursued (see **Section 6.2**). It is important that relevant best practices emerge in order to drive school improvement processes in the field of ICT and ensure that all children and young people in education are prepared for their future life in the digital age.

As it emerged from the data, adequate IT equipment and a supportive IT infrastructure should be provided to all schools in order to bridge the digital divide. Further, common and unified understanding of the use of ICT in teaching and learning is needed in schools. School-wide strategy/understanding would support teachers in using ICT in teaching and learning, as well as provide ways to make sense of why and how ICT is used in education. Currently, there are different and, in some cases, contradicting understandings among teachers when it comes to using ICT in education. This is evident in the finding that there is discrepancy between the opinions of children and young people and teachers about how digitally competent children and young people are. Children and young people consider themselves digitally quite competent, but teachers do not agree. This might be because teachers and children and young people have different understandings and interpretations of what it means to be digitally competent in the contemporary world.

From the national stakeholders' interviews, there was one message that the schools should take advantage of the use of ICT, pay attention to its' effectiveness, and think carefully how it could serve better their needs and how it would benefit the whole school's life (strategic planning). This is once again related to the common and unified understanding of ICT competences.

With regards to teachers, central efforts for investing in human resources (e.g. ensuring continuous training for teaching staff so they would be willing and ready to integrate digital tools in the teaching process) should be amplified. In addition to investing in human resources (teachers), it is important to counsel parents, teachers and children about ICT in order to understand their potential and risks.

In summary, as previously discussed (see **Section 6.2**), the following eight points drawn from the findings have proved to be of central relevance for best practice in the context of ICT in education:

- Ensuring adequate IT equipment and infrastructure in schools,

- Involving all children and young people equally in school digital learning,

- Embracing a student-centred approach to digital learning in teacher education,

- Relying on participatory ways in learning and school improvement processes,

- Making use of democratic and student active digital learning approaches in a future-oriented school culture,

- Putting effort in digital responsibility and supporting it via school learning,

- Supporting teachers' transformative digital competence, and

- Developing teacher collaboration and a culture of sharing.

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Beyond participation:
Video workshops across Europe to engage in research with children and young people and teacher candidates as collaborators investigating ICT in education

Gianna Casamassima, Birgit Eickelmann, Amelie Labusch, Kerstin Drossel, Monica Barbovschi, Greta Björk Gudmundsdottir, Halla Bjørk Holmarsdottir, Aggeliki Kazani, Louise Mifsud, Dimitris Parsanoglou, Merike Sisask, Maria Symeonaki, Gertha Teidla-Kunitsõn

DigiGen

The impact of technological transformations on the Digital Generation

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Author (s): Gianna Casamassima, Birgit Eickelmann, Amelie Labusch, Kerstin Drossel, Monica Barbovschi, Greta Björk Gudmundsdottir, Halla Bjørk Holmarsdottir, Aggeliki Kazani, Louise Mifsud, Dimitris Parsanoglou, Merike Sisask, Maria Symeonaki, Gertha Teidla-Kunitsõn

Abstract: This paper presents a description of the innovative method of video workshops used in the DigiGen project and its implementation in the field of ICT in education in five European countries. This method aims at investigating children's and young people's reflections and perceptions on education preparing them for life in the digital age in Estonia, Germany, Greece, Norway, and Romania. Drawing on the collaborative ethnography approach followed in the DigiGen project, one important aspect of the video workshops is the participation of children and young people - together with teacher candidates - as co-researchers and experts. However, this paper is primarily intended to provide insights into the implementation of the video workshop method in these five countries and some initial implications that result from this.

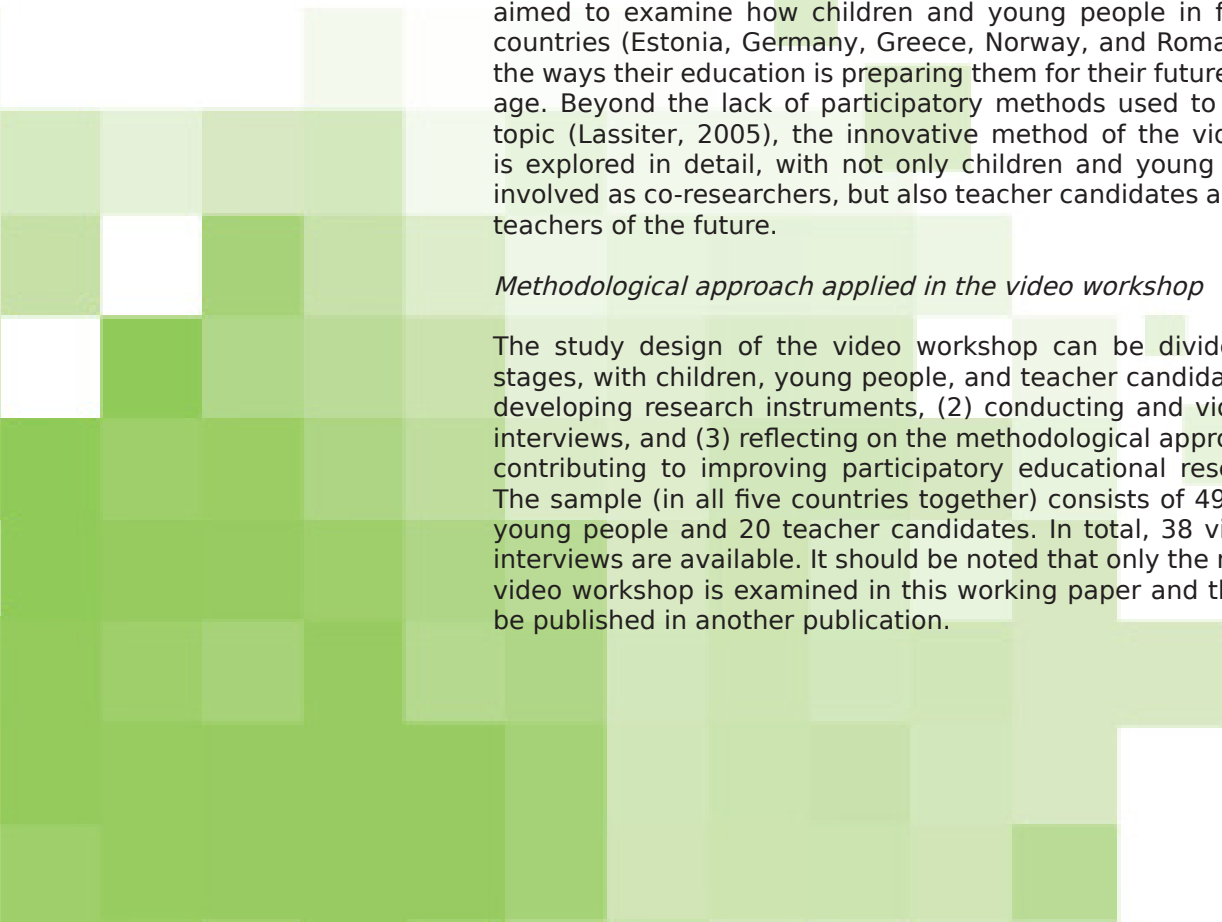## Acknowledgements

Table of Contents

Executive Summary

This paper describes the innovative qualitative approach of a video workshop in the DigiGen project and its implementation in research on information and communications technology (ICT) in education in five European countries. This methodological approach aims to explore children's and young people's perceptions and reflections on education that prepares them for life in the digital age in Estonia, Germany, Greece, Norway, and Romania. Drawing on the collaborative ethnography approach followed in the DigiGen project, one important aspect of the video workshops is the participation of children and young people, together with teacher candidates, as co-researchers and experts. However, this paper is primarily intended to provide insights into the implementation of the video workshop method in these five countries as well as some initial implications that result from this.

Introduction

In the EU-funded Horizon 2020 project, "The Impact of Technological Transformations on the Digital Generation (DigiGen)" (duration: 2019-2022), the research in the work package focusing on "ICT in education" aimed to examine how children and young people in five European countries (Estonia, Germany, Greece, Norway, and Romania) perceive the ways their education is preparing them for their future in the digital age. Beyond the lack of participatory methods used to research this topic (Lassiter, 2005), the innovative method of the video workshop is explored in detail, with not only children and young people being involved as co-researchers, but also teacher candidates as they are the teachers of the future.

Methodological approach applied in the video workshop

The study design of the video workshop can be divided into three stages, with children, young people, and teacher candidates (1) jointly developing research instruments, (2) conducting and video recording interviews, and (3) reflecting on the methodological approach and thus contributing to improving participatory educational research design. The sample (in all five countries together) consists of 49 children and young people and 20 teacher candidates. In total, 38 video-recorded interviews are available. It should be noted that only the method of the video workshop is examined in this working paper and the results will be published in another publication.

Country profiles

The video workshop is structured in the same way in all five countries. Although there are differences in the recruitment of the sample, the setting, the interview guidelines developed, the content of the recorded videos, the experiences, and the implications, the respective implementation is described in country profiles.

Experiences and implications within the method of video workshops for further research

During the implementation of the video workshop, a variety of experiences and implications for further research emerged. Overall, it is a method that is perceived very positively by all participants. On the one hand, there are challenges. These include the fact that implementing the video workshop requires a high degree of preparation in advance and sensitivity on the part of the researchers, with the recruitment process in the context of the COVID-19 pandemic proving to be difficult. During the video workshop, depending on the age of the children and young people, more or less support is needed in question development, which decreases with increasing age. It has also been found that it is more difficult to take on the role of the interviewer than to be interviewed oneself. On the other hand, the benefit of the method outweighs the challenge: the video workshop has proven a useful method which uncovers previously hidden aspects of how children and young people view their education in terms of preparing for future life in the digital age. This is due to the participating children and young people as well as teacher candidates all receiving the opportunity to come up with their own interview questions. It is, therefore, worthwhile to consider this particular method and take it into account in future research.

1. Introduction

1.1 DigiGen – What and Why

The digital transformation of everyday life and the rapid growth of information and communication technologies (ICT) affect all areas of life (European Commission, 2020a, 2020b; Organisation for Economic Co-Operation and Development, 2020; The United Nations Educational, Scientific and Cultural Organization, 2021). Thus, it is vital to develop significant knowledge about how children and young people use and are affected by technological changes in their everyday lives. Research must centre on different fields of children's and young people's daily lives in order to identify which beneficial, but also harmful, effects of their use of ICT occur as a means to develop effective strategies.

The EU-funded Horizon 2020 project, "The Impact of Technological Transformations on the Digital Generation (DigiGen)" addresses this very issue by aiming to investigate the impact of technological change and ICT use on different areas of children's and young people's daily lives, and in particular, education, family, leisure, and civic participation (see Figure 1).
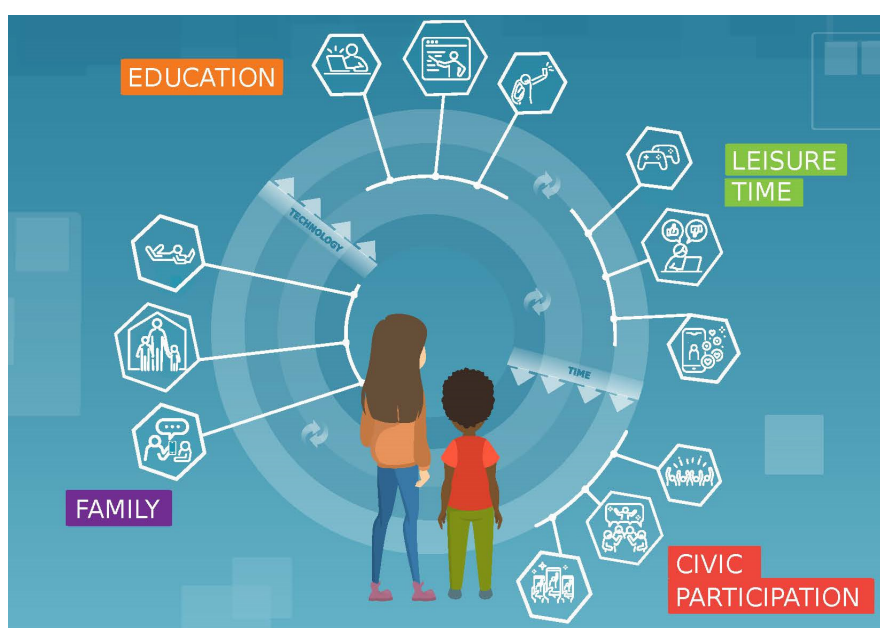

Figure 1: Research fields in the DigiGen Project (DigiGen, 2020)

In addressing the risk of a widening educational divide and further inequality, it is important for DigiGen to also consider the aspect of vulnerability, i.e. according to Lotz (2016), an inherent quality of human beings is the dependence of every human being on others and the affective social nature of human beings. In this context, the vulnerability of children and young people is characterised by the life phase of growing up and the process of finding one's place in the world in which coping with challenges depends on others' support. The decisive factor for assigning children and young people to a vulnerable group is not necessarily their individual characteristics (e.g. their gender or their social or migration background), but rather the conditions to which they are exposed, i.e. vulnerability can arise from personal, social, economic, or environmental conditions in a person's life (e.g. social exclusion and social inequality, as well as gender inequalities). The crucial issue at stake is that vulnerable groups are more affected by stressful

or threatening situations than resilient groups. While it is possible that vulnerable groups are not identifiable in stable situations, they are unequally more affected in threatening situations. In this context, vulnerabilities represent the circumstances in which vulnerable groups are particularly at risk (e.g. risks or threats to well-being and health, which are expressed in the use of ICT by children and young people).

Referring to this, the DigiGen project aims to develop knowledge of how and why some children and young people benefit from the use of ICT, while others seem to be impacted negatively in their everyday lives (e.g. European Commission 2020a, 2020b; Ottestad & Gudmundsdottir, 2018; van Deursen & van Dijk, 2019; van Dijk, 2020). This is achieved using participatory methods. The project focuses on children and young people (up to 18 years), which is also referred to as the digital generation. Keeping with the collaborative ethnography approach, the digital generation is involved as co-researchers and several innovative methods are used within the project.

The overall project, carried out across multiple European countries, is divided into different work packages. Four of these packages (WP's 3-6) aim to generate new empirical data on the impact of digital transformations in children's and young people's everyday lives regarding family, education, leisure time, and civic participation. Information and communication technologies in education will be the focus of the following chapters.

1.2 DigiGen – ICT in Education

Following a collaborative ethnographic approach and focusing on "ICT in education," research aims to examine how children and young people in five European countries (Estonia, Germany, Greece, Norway, and Romania) perceive the ways their education is preparing them for their future in the digital age. These five European countries have been chosen as they represent a variety of educational systems, e.g. referring to ICT infrastructure of schools and ICT use at and for schools to foster digital skills (Eickelmann et al., 2021). Particular attention is given to the transition into a new formal educational phase, marking an important milestone in the lives of children and young people growing up across Europe (McCoy et al., 2020). However, it should be noted that the transition phase in the countries takes place at different ages. While this phase occurs between 4th and 5th grade in Germany—the children in the youngest age group of the five countries (approximately between 9 and 11 years)—young people in Estonia go through a formal transition phase between 9th and 10th grade at around 15 to 16 years old. In the work package, "ICT in education" in the DigiGen project, the following research question is addressed: "How do children and young people regard their education in terms of preparing them for future life in the digital age?"

Beyond the lack of participatory methods used to research this topic (Lassiter, 2005), there is a need for new and innovative ways to contribute to the development of effective educational ICT-related policies and practices in education, which draw on the perspectives of the children and young people themselves. This gap is addressed by the innovative method of the so-called video workshop in which, not only children and young people were involved as co-researchers, but also teacher candidates as they are the teachers of tomorrow. This method was also carried out to gain insights and knowledge on school and how ICT is being used since they are experiencing it first-hand. Through bringing children, young people, and teacher candidates together in the video workshop, they achieved a space to raise their awareness of the issues they face in terms of technological transformations in education.

2. Methodological Approach Applied in the Video Workshop

Based on the idea of collaborative ethnography, where collaboration refers to the relationship between researchers and those being researched to create an ethical and authentic representation of the group at the centre of the research, children, young people, and teacher candidates are involved as collaborators in the research process (Clerke & Hopwood, 2014; Lassiter, 2005). In the DigiGen research on "ICT in education," video workshops were implemented as a research method in which children, young people, and teacher candidates explored the research question addressed in the work package: "How do children and young people regard their education in terms of preparing them for future life in the digital age?" This involved both children and young people, as well as teacher candidates acting as co-researchers and co-constructors, developing research instruments and conducting research to explore the main research question.

To describe the methodological approach applied in the video workshop, section 2.1 of this chapter outlines a description of the adopted design and the sample. This is followed by an introduction to phases of instrument development referring to interview guidelines and the implementation of interviews within the video workshop (see section 2.2).

2.1 Design and Sample

Design

At the heart of the video workshop is, on the one hand, the perspectives of children and young people and, on the other hand, the aim to bring teacher candidates and schoolchildren into a direct exchange.

To get to the bottom of the younger generation's perspective towards digital education and gain insights into the subjective perspectives, encouraging children and young people to share their experiences, needs, and wishes in terms of preparation for future life in the digital age, video workshops were facilitated by researchers in five European countries (Estonia, Germany, Greece, Norway, and Romania). This brought together children and young people, as well as teacher candidates who are actively engaged as experts and co-researchers. The term "video workshop" is derived from the fact that interview guidelines are developed in a workshop followed by interviews conducted and video recorded by and with participants.

The research subjects' participation as collaborators, co-designers, and co-researchers proceeds in several stages: 1) jointly developing research instruments, i.e. interview guidelines addressing the main research question about how children and young people regard their education in terms of preparing them for future life in the digital age; 2) conducting and video recording interviews; and 3) reflecting on the methodological approach, and thus contributing to improving participatory educational research design.

According to the stages, the video workshop is divided into three main parts:
(1)   Preparation of video-recorded interviews
(2)   Implementation of video-recorded interviews, and
(3)   Reflecting the methodological approach.

Both parts are carried out in the same manner in all five countries according to a previously developed and defined scheme.

(1) Preparation of the video-recorded interviews

During the first part of the study, participants were introduced to the DigiGen project and its research topic followed by a methodological introduction focusing on the development of interview guidelines and how to conduct an interview. In group work phases, the children and young people attending classes after the formal school transition jointly developed questions they would like to ask children and young people attending classes before the formal school transition. This was done in order to explore how children and young people regard their schools in preparing them for the digital age.

Similarly, teacher candidates focusing on teaching classes right before and after the formal school transition worked together to develop questions to address in the interviews they conducted, with children and young people attending classes before or after the formal school transition.
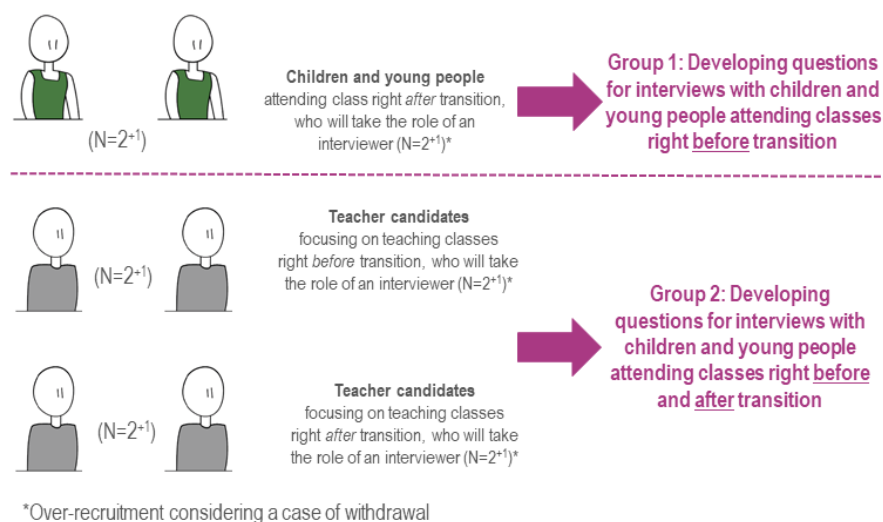

Figure 2: Groups preparing video-recorded interviews

Teacher candidates had the opportunity to ask the researchers for help at any time during the interview. While in some countries, the group of children and young people receive support from a researcher who helps them when they have trouble thinking of questions, children in other countries were left to come up with questions entirely (or almost entirely) on their own.

(2) Implementation of video-recorded interviews

The second part of the workshop was devoted to conducting and video-recording at least six interviews in each country. Children, young people, and teacher candidates who developed a guideline with questions were the interviewers and they interviewed a child or young person in tandem pairs or groups. These six tandems were composed in such a way that children and young people attending classes right after the transition (N = 2) interviewed two of those attending classes right before the transition (N = 2), and children and young people from both educational levels (N = 2/each level) were interviewed by teacher candidates who would be teaching the respective levels in the future (N = 2/each level).
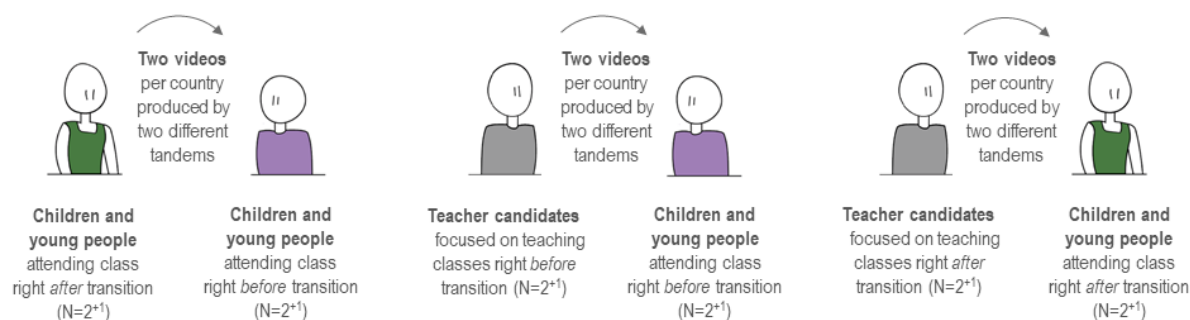
*Over-recruitment considering a case of withdrawal

Figure 3: Tandems implementing video-recorded interviews

These interviews were then video recorded so that at least six videos were available in each country. Due to over-recruitment, which was required considering the potential for withdrawal, particularly against the backdrop of COVID-19, different numbers of video-recorded interviews emerged in the participating countries. Considering the varying pandemic situations in the participating European countries, each country decided individually whether the video workshop had to be conducted in person or online using video conferencing tools (for country-specific details, see chapter 3).

(3) Reflecting the methodological approach

During the video workshop, it was intended that children and young people as well as teacher candidates could give feedback on the methodological approach of the video workshop. The countries were free to ask for feedback after the preparation of the videos as well as after the implementation of the videos or only after both phases.

Sample

In each participating country, the sample was comprised of children and young people attending classes right before transition (N = at least 4) and children and young people attending classes right after transition (N = at least 4). Furthermore, teacher candidates seeking standardised training for a certificate to teach children and young people before transition (N = at least 2) and after transition (N = at least 2) participated and differed not only in gender, but also in subject areas they focus on as well as institutions they attend for teacher training. Involving teacher candidates is vital to this research as the participating teacher candidates will have a chance to learn directly from children and young people about their current and past experiences and wishes in terms of ICT in education.

By the general method of snowball sampling (Cooksey & McDonald, 2019; Naderifar et al., 2017), various approaches to recruit children, young people, and teacher candidates were pursued. This included national networks—most notably, the national stakeholder committees engaged in the project—educational institutions, and links to related research projects.

The sample (in all five countries together) consists of 49 children and young people and 20 teacher candidates. In total, 38 video-recorded interviews are available. Table 1 shows the

samples of children and young people as well as teacher candidates divided into their functions as interviewers and interviewees in the five countries.

Table 1: Video workshop samples

Country	Number of children and young people in the role of interviewers	Number of teacher candidates in the role of interviewers		Number of children and young people in the role of interviewees	
	After transition	Before transition	After transition	Before transition	After transition
Estonia	3	1	2	4	3
Germany	2	2	2	4	3
Greece	2	2	1	4	1
Norway	5	3	3	11	5
Romania	2	2	2	4	2
Total	14	10	10	27	14

Since the focus is set on educational transition phases, the children and young people participating differ in terms of age in the different countries according to the different educational systems, ranging from nine to 16 years across all countries. Aiming for diversity in the sample, children and young people further differ in terms of gender, types of school, and individual background characteristics. Table 2 shows each country's composition with the allocated individual characteristics as sampling criteria.

Table 2: Composition of the video workshop children and young people sample

Country	Number of children and young people	Age range	Gender		Migration background		Socio-economic status		
			Female	Male	Yes	No	High	Middle	Low
Estonia	9	15-16	5	4	-	9	1	6	2
Germany	9	9-10	5	4	2	7	1	5	3
Greece	7	12-13	1	6	-	7	2	4	1
Norway	16	12-13	14	2	2	14	-	16	-
Romania	8	10-12	8	-	-	8	1	6	1
Total	49	9-16	33	16	4	45	5	36	8

The table shows that there is an age range between the youngest children (9 years) in Germany and the oldest young people (16 years) in Estonia. In the sample selection, attention was paid to drawing a variety of children and young people in terms of gender, migration background, and socio-economic status so that the development of the questions and the content of the video-recorded interviews would be as diverse as possible.

2.2 Focus Areas in Question Development and Interview Implementation

The way in which implementation has actually taken place in the individual countries is outlined in the individual country profiles in chapter three. To allow for a cross-country comparative analysis of the video-recorded interviews, taking into account that different interview guidelines were developed in each country, three topics were determined in the context of an expert meeting of the authors and were focused on in developing the interview questions in all countries:

What is taught about ICT at school

The interview guidelines to be developed should relate, among other things, to what is taught about ICT in school.

Posed challenges using ICT at school

Furthermore, there will be a focus on challenges that arise when using ICT in schools.

Digital skills required in the future

In addition, the interview guidelines should address digital skills that will be required in the future.

Exemplary questions on all three main topics, as well as further exemplary questions that do not directly relate to one of these three main topics, are given in the following chapter providing country profiles of the five participating countries.

3. Country Profiles

Elaboration on concrete methodological implementation in the different countries and key findings regarding the abovementioned research questions will form the basis for individual country profiles before moving on to cross-country implications for educational research emerging from implementation of the collaborative methodological approach applied through the video workshops (see chapter 4).

In the following sections, the country profiles of the individual countries – Estonia (section 3.1), Germany (section 3.2), Greece (section 3.3), Norway (section 3.4), and Romania (section 3.5) – are introduced. These are all structured in the same way according to the video workshop recruiting process, the video workshop setting, the core observations in both video workshop parts, and potential conclusions and implications from the video workshops for further DigiGen research in the respective countries.

3.1 Estonia

Video workshop recruiting process in Estonia

The recruiting process turned out to be very challenging for several reasons. While the video

workshop was planned on the week of a school holiday, allowing students to take part in the workshop without missing any classes, they were still busy with other activities (hobbies, family trips, etc.). The students were recruited via teachers in schools, public sharing of the invitation (Facebook), and with peer-to-peer calls among those students who had already given their consent to participate. One impact of COVID-19 was that not all participants were able to participate in the face-to-face workshop after the regulations regarding the increase in COVID-19 infections were enforced prior to workshop. The workshop was moved online in order to allow all of the recruited participants to take part.

Recruiting teacher candidates proved even more challenging. For this, short video introductions were created and shared on several lists, including those for teacher candidates in several curriculums at Tallinn University and outside of the university among projects and associations that unite teacher candidates. The invitation was shared with the teachers who participated in another part of DigiGen with the request to share the invitation among their colleagues at other schools.

Overall, 16 people were recruited, resulting in 12 of them participating in the workshop and conducting seven interviews. One of the 10th grade participants had both the role of interviewer and interviewee in separate interviews.
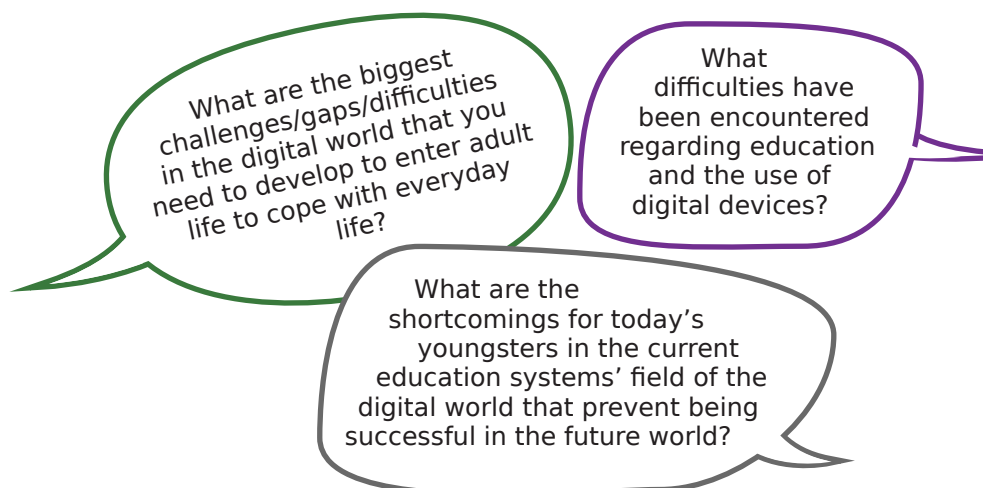
Video workshop setting in Estonia

Although prepared as an on-site video workshop, the regulations regarding the spread of COVID-19 were changed a few days before, resulting in having the video workshop conducted online (via Zoom, with breakout rooms) on 26 October 2021. Three researchers facilitated the workshop from 11.00-15.30 with several breaks, including a lunch break. The day was divided into three sessions: (1) to get to know each other, the DigiGen project, and the interview method; (2) preparations of the interviews; and (3) carrying out the interviews. The workshop brought together four 9th graders (before transition) and five 10th graders (after transition), five of which were female and one male, eight 16-year-olds and one 15-year-old. Among the three teacher candidates, there was one student who had just started his BA studies to become a teacher, one who was already working as a teacher while obtaining his MA, and one who was actively working at a school as a teacher while obtaining her MA in Education Management. The teacher candidates were two males (age 23 and 25) and one female (age 23).

Core observations video workshop part I: Development of interview questions by children and young people and teacher candidates in Estonia
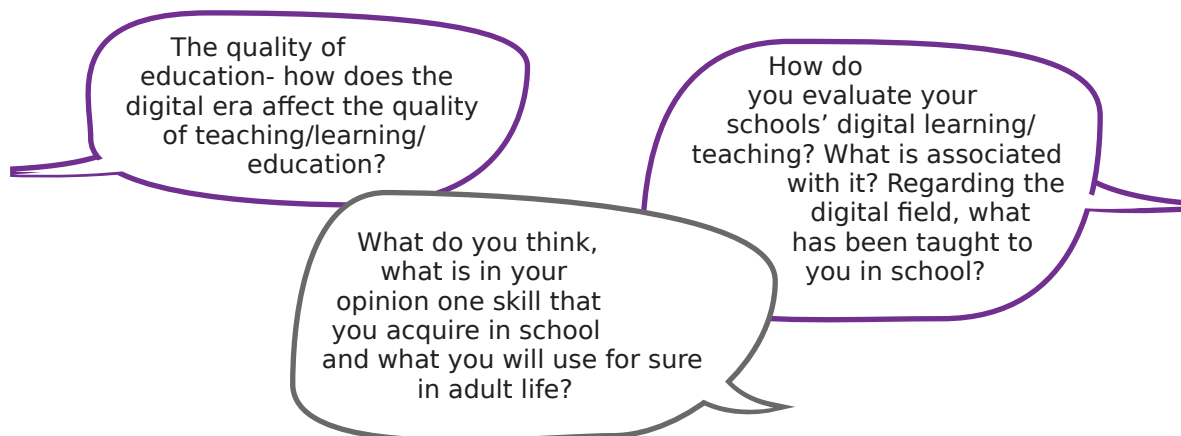
Development of interview questions by children and young people

There were three students (10th graders) preparing the interviews with students before transition (9th graders). For developing the questions, students worked in separate breakout rooms with the supervision of one researcher. The template for developing the questions gave students the main topic (if and how today's education prepares young people for adult life in the digital era) with three sub-categories (digital competences taught in school; challenges and difficulties; and digital skills needed in the future). One of the participants was more active than the other two. The researcher attending the group was asked for advice regarding wording. Overall, the participants managed very well in coming up with questions, although it was challenging to find the correct wording for the questions. The questions they developed were very on-topic and focused. Some of the questions prepared were:

> What are the biggest challenges/gaps/difficulties in the digital world that you need to develop to enter adult life to cope with everyday life?

> What difficulties have been encountered regarding education and the use of digital devices?

> What are the shortcomings for today's youngsters in the current education systems' field of the digital world that prevent being successful in the future world?

Development of interview questions by teacher candidates

There were three teacher candidates developing the questions in a separate breakout room with one researcher supervising them. Similarly to the young people, teacher candidates had a template with the topics to help them develop the questions. The teacher candidates decided not to differentiate the questions for 9th and 10th grades, arguing that the age gap is almost non-existent. Far more questions were developed than what the duration of the interview (approximately 20 minutes) allowed. Teacher candidates agreed that, during the interviews, each of them would handpick their most favoured questions. Opposed to young people, teacher candidates emphasised the questions (while preparing questions and also interviewing) related to distance learning as the result of the COVID-19 pandemic. Their questions partly focused on specific apps and environments used in education (e.g. Kahoot, eSchool, Quizlet) or overarching skills developed during distance learning (self-management, time-planning, concentration, etc.). Some of the questions the teacher candidates prepared included:

> The quality of education- how does the digital era affect the quality of teaching/learning/ education?

> How do you evaluate your schools' digital learning/ teaching? What is associated with it? Regarding the digital field, what has been taught to you in school?

> What do you think, what is in your opinion one skill that you acquire in school and what you will use for sure in adult life?

Core observations video workshop part II: Implementation of the interviews by children and young people and teacher candidates in Estonia

The methodological premises of the workshop allowed participants to raise the questions and issues important to them, regardless of their importance to the study. This created an ethical, but also methodological, dilemma regarding whether to get involved as a researcher in the creation of the questions or interviews when perceived that it does not solely focus on the study's aim. For collaborative research, understanding the questions participants developed was as important as the interviews conducted. In the case of Estonia, we decided to allow
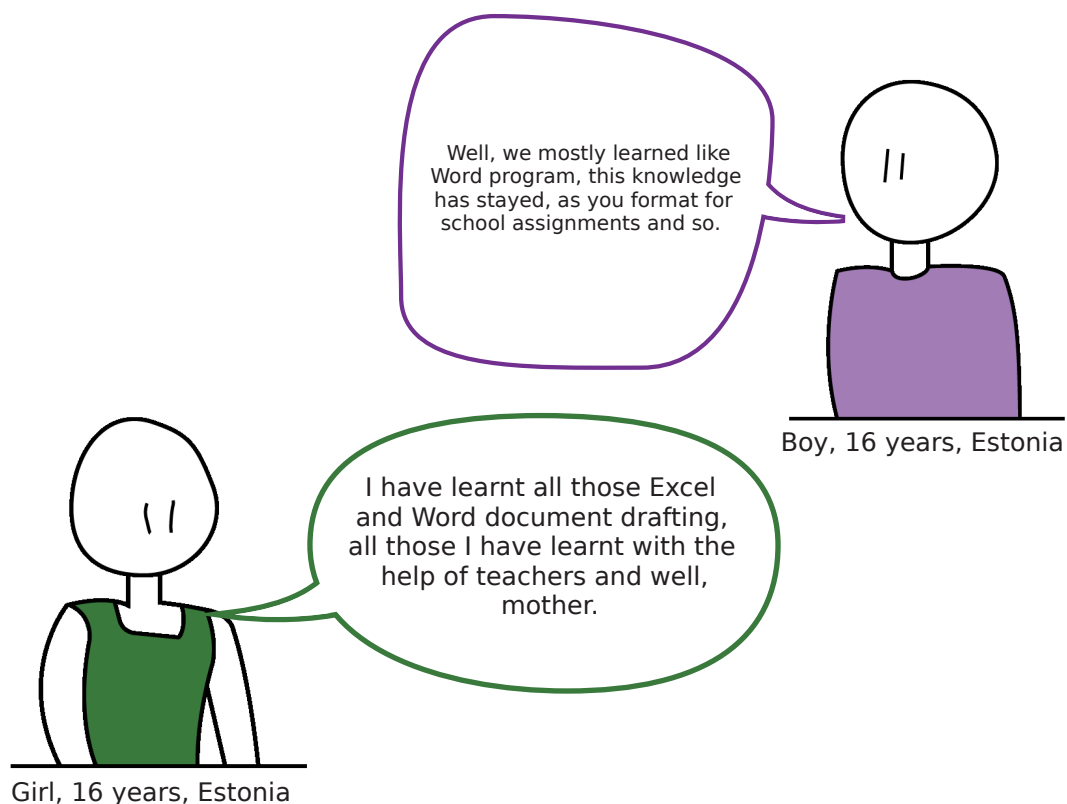
participants to lead us to the topics and issues important to them, regardless of the provided focus and topics of the study. In some interview tandems between teacher candidates and students, the teacher candidates positioned themselves from the perspective of teacher, rather than on the equal level of young people. The inequality was not observed in tandems between young people.

The workshop made it possible to gain insight of what is considered important in education and ICT and even what one considers to be ICT. For teacher candidates, ICT was generally seen as online classes, and importance was given to overarching skills, such as self-management with time-planning and the ability to concentrate. Teacher candidates also encouraged young people to ask for help from their teachers when needed. For young people, ICT was seen as Microsoft programs, different operating systems, online environments, and programming. Interestingly, while most children and young people thought schools should teach more in regards to ICT, when asking what should be taught, they usually wanted a deeper knowledge of Microsoft programs, instead of acquiring new skills or knowledge.

Perspectives of children and young people towards addressing what is taught about ICT in school

What is taught about ICT at school

Basic skills in programs such as Microsoft Word, Excel, Google Docs, and PowerPoint were referred to in regard to what ICT skills are taught at school. In addition, different online environments were described. To add, one participant addressed online behaviour as something that was discussed in school. Many found that schools could teach much more regarding ICT (e.g. advanced Excel and Word, Cloud systems) as some of the children and young people had to learn Microsoft Office programs on their own. There was also a wish to learn programming languages in school.
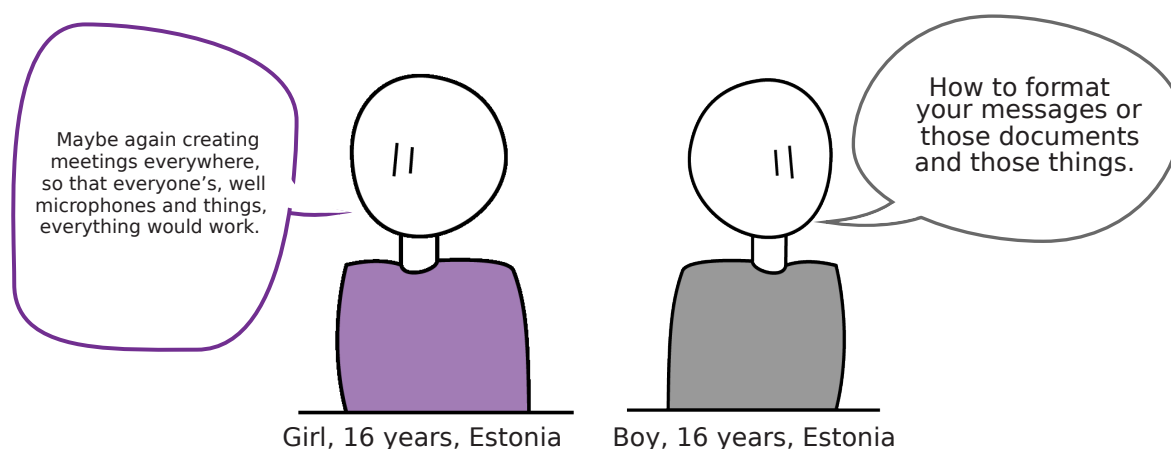

Well, we mostly learned like Word program, this knowledge has stayed, as you format for school assignments and so.

Boy, 16 years, Estonia

I have learnt all those Excel and Word document drafting, all those I have learnt with the help of teachers and well, mother.

Girl, 16 years, Estonia

Perspectives of children and young people towards addressing posed challenges using ICT
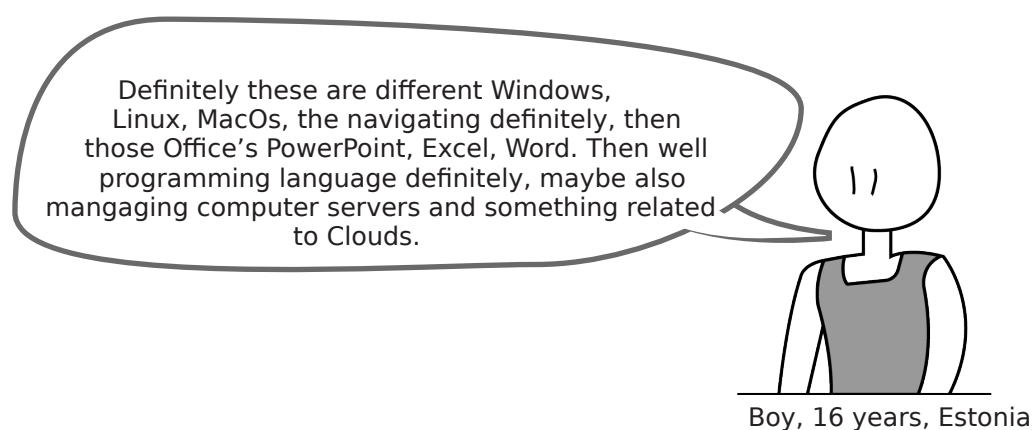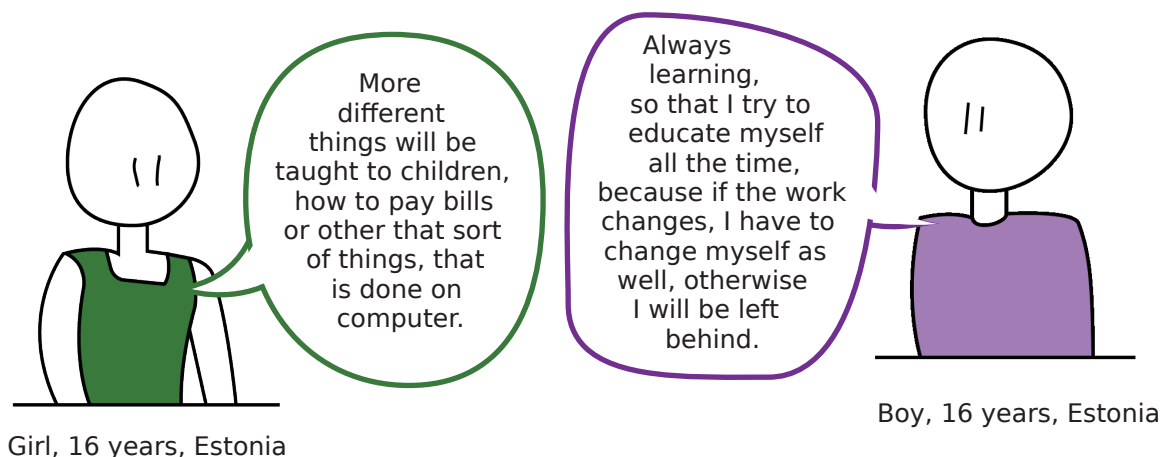
The challenges of using ICT are largely connected to one's ability to concentrate instead of a lack of specific skills or knowledge when using ICT. Although it was the opposite for some participants, learning with ICT allowed others to focus even more as the home-environment is quieter and classmates were not there to interrupt their focus.

Posed challenges using ICT at school

In some cases, it was challenging for students to work on their own with PowerPoint and Word. One participant considered online meetings to be the biggest challenge (e.g. working microphones, clear sound). Different challenges were posed by one student – with the digital age, everyone is sitting at home, more thoughts should be given on nutrition to avoid becoming overweight.

Maybe again creating meetings everywhere, so that everyone's, well microphones and things, everything would work.

How to format your messages or those documents and those things.

Girl, 16 years, Estonia   Boy, 16 years, Estonia

Perspectives of children and young people towards addressing future digital skills

Digital skills required in the future

Young people see the future as being even more digitalised than it is now; therefore, people will learn more in order to be able to deal with it. Excel, Word, and PowerPoint are still considered useful for the future in order to draw up documents or analyse data. For the future, more knowledge and skills regarding Cloud systems would be necessary. Digital signatures are also seen as necessary for the future. Navigation in operating systems, such as Windows, Linux, and MacOs, is considered necessary for the future. In addition, programming was seen as a future digital skill together with knowing how to manage computer servers. One participant considered using Gmail as a skill to develop in his adult life. Another young person brought up their hope for more digital learning and teaching children how to pay bills, etc., on the computer in the future. Regarding future digital skills, children and young people seem to value lifelong learning in order to be able to cope with the changing world.

More different things will be taught to children, how to pay bills or other that sort of things, that is done on computer.

Always learning, so that I try to educate myself all the time, because if the work changes, I have to change myself as well, otherwise I will be left behind.

Girl, 16 years, Estonia

Boy, 16 years, Estonia

Definitely these are different Windows, Linux, MacOs, the navigating definitely, then those Office's PowerPoint, Excel, Word. Then well programming language definitely, maybe also mangaging computer servers and something related to Clouds.

Boy, 16 years, Estonia

Potential conclusions and implications from the video workshops in Estonia for further DigiGen research

After each interview, the participants were directed back to the main room in the Zoom call where they provided short feedback regarding their experience. Participants experienced a greater challenge in taking on the role of the interviewer than answering the questions. The young people considered some questions difficult, making them think of new perspectives about which they had not previously thought. Overall, feedback was positive and the participants seemed to enjoy the experience.

To conclude, the young people who participated would like to have more ICT classes to delve more deeply into Excel, Word, and PowerPoint, while knowledge in programming and computer servers was welcomed as well. Comparing what is taught at school, participants were, on the one hand, satisfied with it, while on the other hand, they also wished to have more knowledge on the very same topics already taught to them. It could be that they lacked ideas in that moment of what else to wish for or what skills and knowledge they do not know about that could prove useful in the future. Regarding the future, young people do see it becoming more digital and, therefore, need more knowledge in working with computers.

3.2 Germany

Video workshop recruiting process in Germany

Recruiting participants posed challenges, especially referring to reaching the target group of vulnerable children and young people. For example, some families lacked the technical equipment or the necessary know-how to let their children participate in a workshop conducted online. In this context, class teachers were of immense support by providing children with printed consent forms to take home with them, and also by calling parents or even providing the participating children with devices so that they could participate.
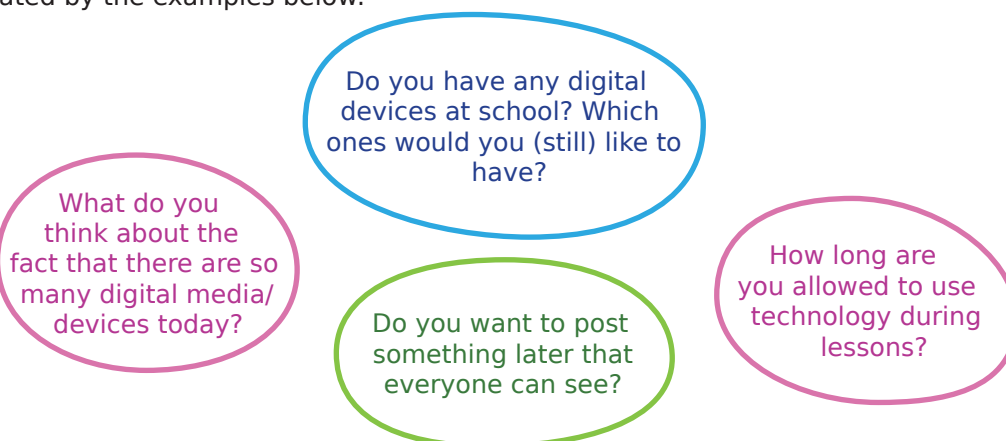
Video workshop setting in Germany

Due to COVID-19 safety regulations and the good experiences with online interviews already conducted in another task in work package 5, the video workshop in Germany was conducted online at the beginning of October 2021 (1 and 2 October). According to the workshop's core structure of two parts, it was facilitated on two consecutive days for approximately three hours each. However, due to withdrawals of children and young people as interviewees with short notice on the second day, an extra video workshop was facilitated on 6 October 2021 in a smaller group, including the primary school teacher candidates who developed questions on the first day (1 October) as well as two fourth graders, the last grade before the transition to the secondary level.

Core observations video workshop part I: Development of interview questions by children and young people and teacher candidates in Germany
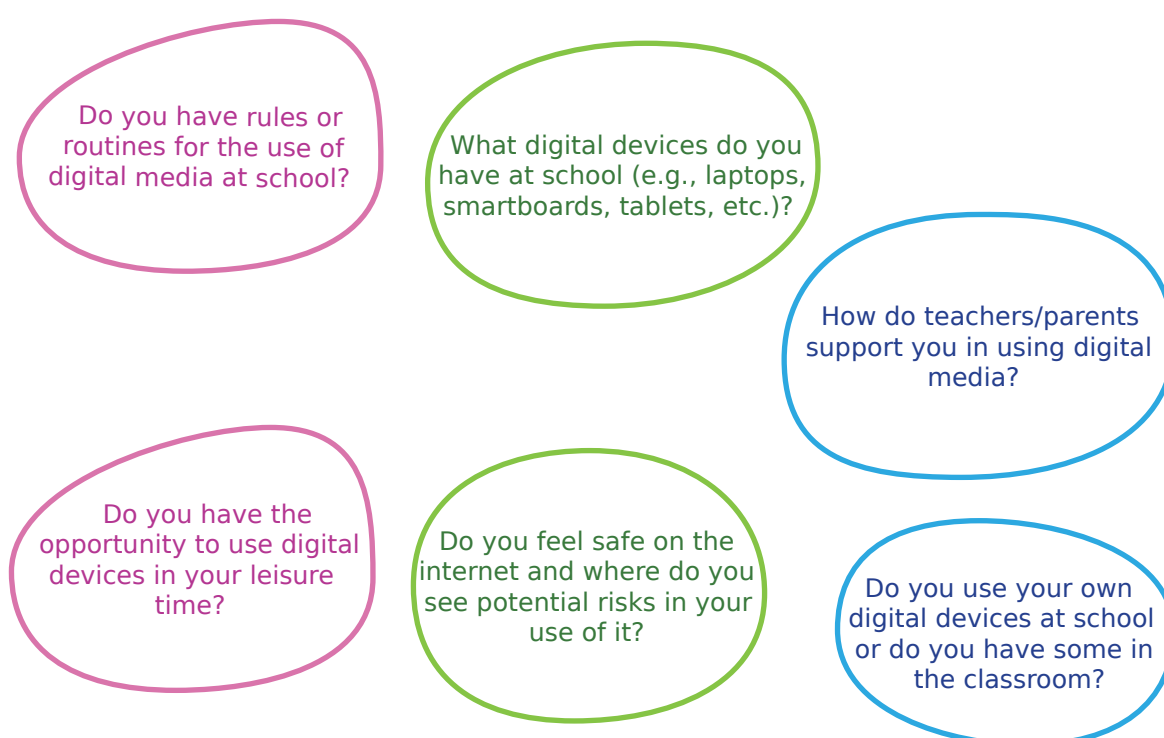
Development of interview questions by children and young people

The children's group worked (two children, 10 years old) to develop interview questions themselves, accompanied by a researcher to help them if needed (see section 2.1). As the two children after transition in Germany were very young, having a researcher with them turned out to be indispensable. The children developed interview questions on their own, but needed some help to stay focused, formulate interview questions, and write them down. In addition, for the children, it was challenging to address two of the given topics: challenges related to digital technology and future digital skills needed. Thus, a researcher's support was appreciated. The two children developed questions focusing on the use of ICT in school, the presence of subjects such as computer science, and a potential desire for "more social media used in class." However, to address the future aspect, it was also important for them to find out what the younger children (grade 4) wanted to be when they grew up and whether it was related to technology. To address the above-mentioned aspects, various questions were developed as illustrated by the examples below:

Do you have any digital devices at school? Which ones would you (still) like to have?

What do you think about the fact that there are so many digital media/devices today?

Do you want to post something later that everyone can see?

How long are you allowed to use technology during lessons?

Development of interview questions by teacher candidates

The teacher candidates developed far more questions than the participating children and it emerged that the group work could have taken even more time for the teacher candidates. The only challenges reported referred to adapting language that was suitable for children aged 9-10. With reference to the three given topics, they developed questions related to the existence of rules or routines while using ICT at school and future skills that children and young people would like "to be able to do on the computer later" (from the interviews of the teacher candidates in Germany focusing on both before and after transition teaching). The teacher candidates, both with a focus on before transition and after transition, have also taken aspects of safety on the internet and risks through the use of ICT into account in developing the questions. Most of the teacher candidates' questions were developed together for both educational levels, and they prepared a few specific questions focusing on the educational level before or after transition into secondary level of school, as illustrated below:

Do you have rules or routines for the use of digital media at school?

What digital devices do you have at school (e.g., laptops, smartboards, tablets, etc.)?

How do teachers/parents support you in using digital media?

Do you have the opportunity to use digital devices in your leisure time?

Do you feel safe on the internet and where do you see potential risks in your use of it?

Do you use your own digital devices at school or do you have some in the classroom?

The teacher candidates, focusing on teaching before transition, were curious to know what the children thought would change in terms of ICT use in secondary school. In contrast, the teacher candidates, focusing on teaching after transition, asked what has changed in the use of ICT in the transition to secondary school and what new challenges have arisen in this context.

Core observations video workshop part II: Implementation of the interviews by children and young people and teacher candidates in Germany

Conducting interviews and recording various breakout rooms to facilitate group work went smoothly. The interview breakout rooms were set up for a maximum of one hour each. It turned out that the interviews between children took less time than the interviews between teacher candidates and children. During the interviews, a variety of responses emerged from the children about how they regard their schools as preparing them for future life in the digital age.

Perspectives of children and young people towards addressing what is taught about ICT in school

What is taught about ICT at school

With reference to what is taught about ICT in school, the use of tablets and learning apps was reported often.
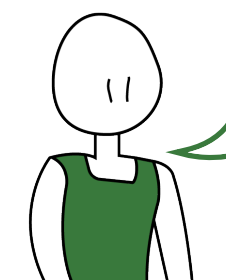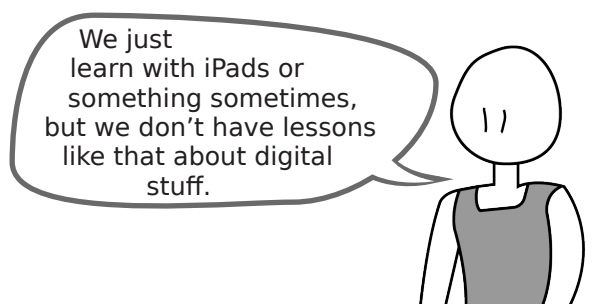
I use the iPad, for example, for Anton. It's a learning app.

We have an app called Anton, which we sometimes use. For homework and sometime for practice.

Boy, 10 years, Germany

Boy, 9 years, Germany

We just learn with iPads or something sometimes, but we don't have lessons like that about digital stuff.

Boy, 9 years, Germany

Perspectives of children and young people towards addressing posed challenges using ICT

Posed challenges using ICT at school

Among the challenges posed using ICT, the children and young people mention aspects of health, unsafe content on the Internet, etc.

Perspectives of children and young people towards addressing future digital skills

Digital skills required in the future

The children's responses include, with reference to digital skills for the future that children and young people want to learn, for instance, to "edit videos to make them really good" (girl, 10 years, Germany), to "colour in pictures on the iPad by Hundertwasser" (girl, 9 years, Germany), and to "order some stuff on the internet" (girl, 10 years, Germany).

Potential conclusions and implications from the video workshop in Germany for further DigiGen research

Overall, the video workshop method proved to provide insightful results in Germany. Due to the positive feedback, especially from the children, further development of this approach should be considered in educational research, or even to expand it into two workshops. One workshop was dedicated to children and young people only, preparing interview questions and conducting interviews, and a separate one was focused on teacher candidates who take more time in each of the phases.

Against the background that it was challenging to reach vulnerable groups, it makes sense to involve teachers (or members of other institutions approached) in the recruiting and implementation processes. Including a researcher to help children and young people develop interview questions proved to be most efficient with children ages 9 to 10.

Throughout the children's question development as well as the interviews with the children, a common theme emerged: the important role of social media for children and an understanding of the use of social media as aspirational digital skills for the future.

3.3 Greece

Video workshop recruiting process in Greece

The recruiting process turned out to be very challenging. Apart from the difficulties as the result of the pandemic, there were difficulties in finding a date and time that would be convenient for the most participants to attend. This also had to do with the fact that the workshop was planned during a busy time in the school year when both children and teacher candidates had increased obligations and extracurricular activities. In addition, all contact with teacher candidates and children's parents, to inform and assure their consent, had to be carried out either by phone or by email.

Therefore, the workshop was held on a Saturday when ten participants were available. However, the available time for the workshop was limited to three and a half hours, which meant that only short breaks were possible between the different phases of the workshop.

Video workshop setting in Greece

The video workshop in Greece was scheduled from the beginning as an online event held on Zoom with breakout rooms. After several attempts to recruit both teacher candidates and children and to find a convenient date for everyone, the workshop was finally held on Saturday, 27 November 2021. Three researchers facilitated the workshop, and it was held from 10.00 to 13.30. The day was divided into three sessions: (1) to get to know each other, DigiGen, and the interview method; (2) preparing for the interviews; and (3) carrying out the interviews. The workshop brought together four 6th graders (before transition, i.e. 11-12 years old), three 7th graders (after transition, 12-13 years old), six males and one female. Among the three teacher candidates who were studying to become teachers, there were two females (21 and 22 years old) and one male (22 years old). The participants were from four different cities, the two largest in the country and two medium-sized in the North and in the South.

Core observations video workshop part I: Development of interview questions by children and young people and teacher candidates in Greece

Development of interview questions by children and young people

There were two students (7th graders) preparing interviews with students before transition (6th graders). For developing the questions, students worked in separate breakout rooms with the supervision of two researchers who initiated the discussion by providing possible ideas for potential questions, without being specific, so that the students themselves formulated the questions. The participants were not active initially and they needed some encouragement to share their ideas. The researchers helped them in finalising questions and kept notes that were given to the students in order to conduct the interview. Some of the questions they developed were general and some were more specific and focused on school and lessons:

Do you think that the use of new technologies is helpful in learning?

Does the use of new technologies make the lessons more interesting?

Does the use of new technologies make the lessons more pleasant?

Do you learn more easily through the use of new technologies?

Did you have any problems with the connection? Did you have any other technical problems?

How was your experience with the Webex?

Did your classmates have problems using Webex?

Do you search on the internet to find information for your lessons/school?

What do you usually do with the computer?

How much time do you spend in front of the computer?

Would you like to know more things about new technologies?

Would you like to be more competent in using the computer?

145

Development of interview questions by teacher candidates

There were three teacher candidates developing questions in a separate breakout room supervised by one researcher. Teacher candidates were much more eager and competent to discuss and prepare their questions. They decided not to differentiate the questions for 6th and 7th graders, arguing that the age gap was not significant. The questions the teacher candidates prepared included:

Do you have any [accounts in] social media?

During the period of distance learning, how did you communicate with your friends? Did you also meet face-to-face?

In general, how did you find this period where classes were held through the computer? Which were the main difficulties? The class? How was it?

When did you get your first mobile phone?

When was the class held face-to-face? Did your teachers use computers or digital media? Did they show you stuff on the computer, e.g., videos? Did you like it? Or you prefer other methods (to discuss...)?

Do you think that you could learn equally well this way? Were there any difficulties?

During the period you had distance learning, did you feel at any moment that some of your classmates were becoming more aggressive in their communication? For example, in the chat, were there disagreements? Or an incident that you remember? Do you think that something like that could happen if classes were held face-to-face?

How did you feel when after so much distance learning, such a long period, you went back to school?

Core observations video workshop part II: Implementation of the interviews by children and young people and teacher candidates in Greece

The participants, even those after transition who were initially timid during the preparation of the interview questions, turned out to be more active during the interviews. Teacher candidates seemed to be comfortable, both in the cases of interviewing students before and after transition.
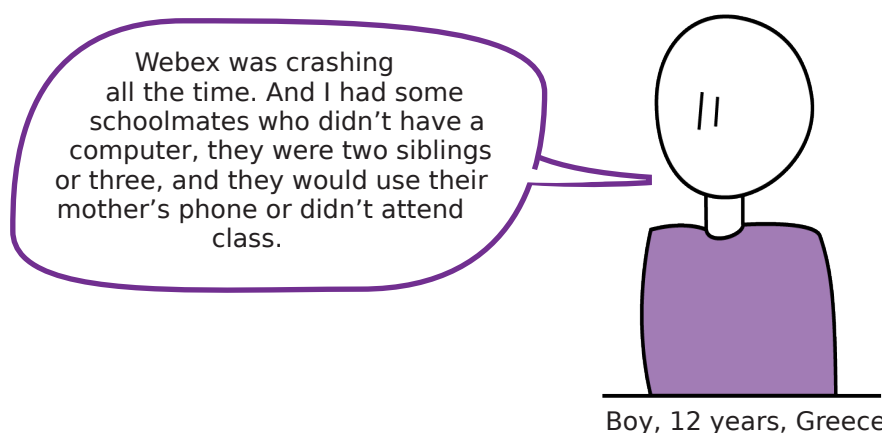
Overall, five interviews were held:

1.   A male teacher candidate interviewing a male student after transition
2.   A male teacher candidate interviewing a male student after transition
3.   A female teacher candidate interviewing a male student before transition
4.   A female teacher candidate interviewing a male student before transition
5.   A male student after transition interviewing a female student before transition

Perspectives of young people regarding the experience of distance learning during the pandemic

Much of the interview questions and responses covered the pandemic and distance learning. The findings from the video workshop correspond to the findings of the interviews held within the main study. Students acknowledged some positive aspects of distance learning, although they seem to prefer going to school and attending classes face to face:

It had some good things, I didn't have to wake up early and go to school, it was also sometimes fun, but I like it more being at the classroom with my friends.

Boy, 12 years, Greece

Technical problems and problems of connectivity, faced by children and young people themselves and by classmates, were also reported:

Webex was crashing all the time. And I had some schoolmates who didn't have a computer, they were two siblings or three, and they would use their mother's phone or didn't attend class.
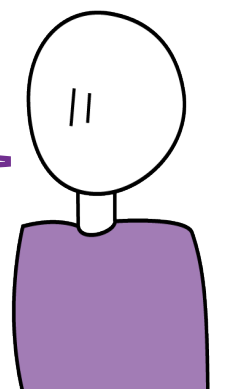
Boy, 12 years, Greece

Perspectives of children and young people towards addressing what is taught about ICT in school

What is taught about ICT at school

The experience of distance learning is considered an opportunity to enhance one's digital skills since the students reported that they became much more familiar with several applications, such as Word, PowerPoint, eClass, and Webex.

However, the general assessment of their school's contribution in acquiring and improving their digital skills is more or less negative:

> When we got back at school things went back to how they were before. Most of the teachers didn't enjoy distance learning and Webex and all, so when schools opened up again they went back to normal.
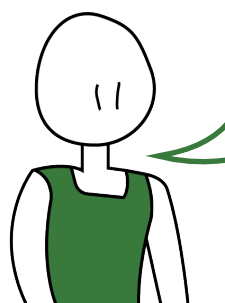
Boy, 13 years, Greece

Perspectives of young people towards the use of digital technologies

All participants were familiar with digital technologies. They use them for several purposes, including gaming and navigating on the internet to watch videos and listen to music. They consider digital technologies essential for their communication with friends, but also with parents, with the latter being the main reason for acquiring their first mobile phone.

> I got a mobile phone last summer. I went to a summer camp for two weeks, so my parents got me a phone, so that we could talk every day.
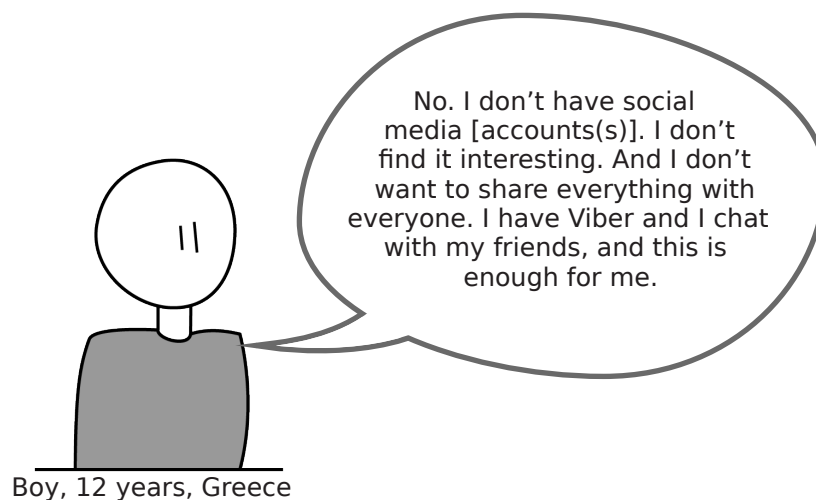
Boy, 12 years, Greece

> I got the mobile phone when I finished elementary school. High school was in a different area, not far from our house, but I am going alone and my parents wanted to feel secure that they can find me anytime.
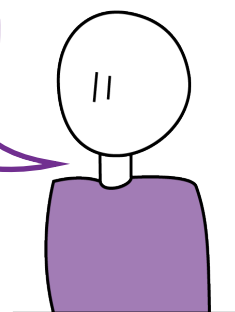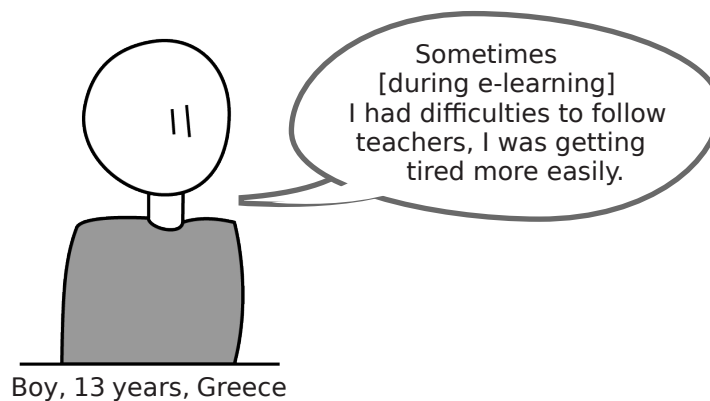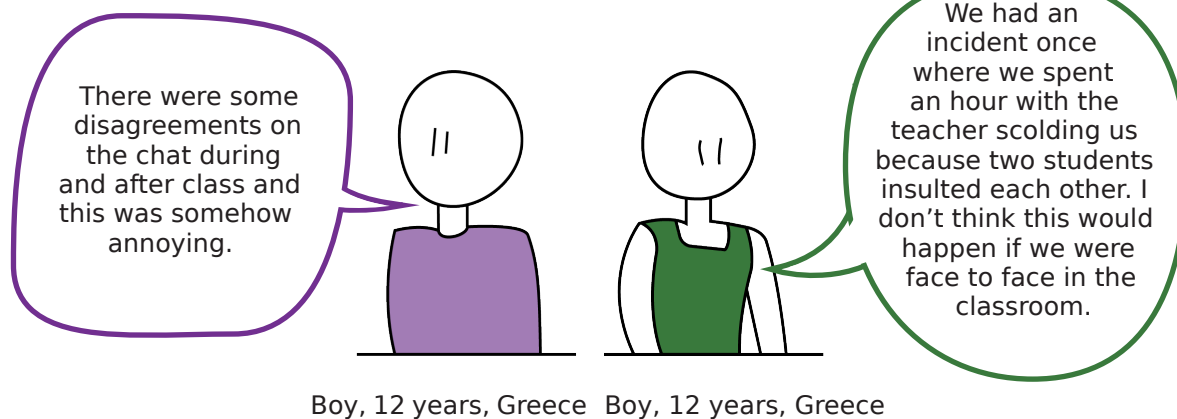
Boy, 13 years, Greece

Although essential for everyday communication, some reluctance towards social media was expressed, particularly from younger participants:

> No. I don't have social media [accounts(s)]. I don't find it interesting. And I don't want to share everything with everyone. I have Viber and I chat with my friends, and this is enough for me.

Boy, 12 years, Greece

Perspectives of children and young people towards addressing posed challenges using ICT

Posed challenges using ICT at school

The challenges that participants mentioned mainly came from the experience of distance education. They referred either to relations among children, e.g. insults or/and misunderstandings, or difficulties in keeping their attention during the class.

> There were some disagreements on the chat during and after class and this was somehow annoying.

> We had an incident once where we spent an hour with the teacher scolding us because two students insulted each other. I don't think this would happen if we were face to face in the classroom.

Boy, 12 years, Greece   Boy, 12 years, Greece

> Sometimes [during e-learning] I had difficulties to follow teachers, I was getting tired more easily.

Boy, 13 years, Greece

149

Perspectives of children and young people towards addressing future digital skills

Digital skills required in the future

The question of what digital skills will be needed in the future was not included in the interview guidelines developed during either of the video workshops in Greece.

Potential conclusions and implications from the video workshop in Greece for further DigiGen research

The content of the interviews did not provide substantially different information from the interviews conducted during the pilot study and the main study of WP5 within DigiGen. However, the most interesting point that participants acknowledged in the workshop's final feedback session was the teacher candidates' and students' active involvement in the research process. Even those who were timid in preparing the interview questions (the two 7th graders) found the experience very interesting and seemed to feel that they were actors in a "scientific" endeavour.

This involvement could serve as a guide for future research designs, based on more participatory methods than the traditional ones. It requires, however, a great deal of effort, especially in the recruitment stage, since children and adults who are not familiar with research do not feel very comfortable or eager taking part in participatory and interactive activities, especially when communication is only conducted through digital means without any face-to-face interaction.

3.4 Norway

Video workshop recruiting process in Norway

The recruiting process proved to be the most challenging part of the video workshop. It was challenging to get children to participate and many of them were probably anxious regarding Covid-19 and meeting other children they did not know. The researchers started by sending out open invitations via e-mail to schools as well as posting on various social media sites. This resulted in only a handful of participants. The research team then contacted colleagues within teacher education and their personal network of teachers who were in contact with 7th and 8th graders. There was also great uncertainty about who would show up on-site on a Saturday morning in the middle of a pandemic, so a decision was made to over-recruit participants. This resulted in 11 7th graders, five 8th graders, and six teacher candidates showing up for the workshop. A total of 14 girls and two boys, in addition to two male teacher candidates and four female teacher candidates, participated. Furthermore, two technical support persons, one research assistant, and three DigiGen researchers were present during the video workshop.

The researchers appreciated to get one parent who brought a group of girls from one Grade 7 class in Oslo. This helped ensure there were enough Grade 7 students to interview. It was challenging to try to organise who would interview who and not being able to plan this aspect in advance. In the end, the interviews were organised in a way that resulted in some one-to-one interviews and other interviews including 2-4 participants (group interview) as some of the children did not feel comfortable being interviewed alone Also, as the research team was responsible for one entire group, the researchers did not want to turn anyone away and attempted to be inclusive and make the best of the situation.

The feedback that the research team received from the participants was extremely positive and the students (both grades 7 and 8) found the workshop both exciting and informative. The mother that brought the group of 7th graders was very positive for the opportunity for the group to participate since, due to Covid-19, the group had had few opportunities to meet each other. This event also contributed to socialisation outside of school. The opportunity to meet up with peers, share a pleasant lunch, and talk about digital technology and how it is affecting young lives today was thus experienced as positive and enjoyable for all those participating.

Video workshop setting in Norway

The Norwegian team organised the video workshop as a one-day, face-to-face event. The video workshop in Norway was organised on-site at the Oslo Metropolitan University. The team considered this important in order to create a good working environment and the possibility for reflection. Due to this, the participants came from Oslo and its surrounding areas, meaning there were no participants representing other parts of the country or remote areas. However, the participants came from a variety of schools (rural, suburban, urban) and represented both private and public schools. The workshop was conducted on a Saturday (November 6th, 2021 from 9:30-16:30, with one hour for lunch) as the children and young people had different timetables on weekdays which made it difficult to find a time that suited everyone. Also, this was the only day possible for parents to accompany their children to the university.

The teacher candidates and the 8th graders were supposed to meet at 09.30 in the morning, starting the workshop at 10.00 sharp. The 7th graders were supposed to meet up at 11.30 starting with a joint lunch. The workshop continued after lunch and was completed at approximately 16.30.

The day of the workshop began with an introduction and information about the goals for the day. Then, the Grade 8 students went into one room to prepare their interview questions while the teacher candidates were placed in another room to prepare their questions. This first part of the day was then spent on the two groups' information-gathering and development of interview questions.

Once the interview questions were prepared, the research team printed them out so that each person had a written set of questions to work with during the interviews. The Grade 7 students joined us at lunch time, and the researchers had a group lunch with all of the participants. In total, there were 28 persons present during the workshop.

The interviews began after lunch, with the Grade 8 students interviewing the Grade 7 students and the student-teachers interviewing Grade 7 and Grade 8 students.

Core observations video workshop part I: Development of interview questions by children and young people and teacher candidates in Norway

Starting the day

The researchers came to the university early in order to set up cameras in six rooms as well as in the plenary room. We organised breakfast for the participants and printed out necessary documents with information. The workshop started by welcoming the participants and introducing ourselves (the researchers) to the parents and the children. The researchers noted down the telephone numbers of parents in case of emergency and made sure that everyone felt taken care of. Some of the participating children were, for example, a bit anxious and found the workshop a bit scary. There were a couple of friends showing up together and the parents told the research team about various aspects we should take into consideration when working with the children. All of these concerns had to be taken into account when dividing them into pairs/

groups. After having introduced the plan for the day and the overall themes of the questions (three mutual themes), the researchers divided the participants into two groups. One group was for teacher candidates and one was for the 8th graders. The participants went into separate rooms to develop questionnaires.

Development of interview questions by children and young people

It was necessary to help the 8th graders in the beginning as they did not fully understand the expectations. The researchers took turns assisting them and, in the end, they came up with a set of questions divided between the three main themes.

The questions were the following:

Do you use technology at school/at home? How much? How do you use it?

What do you think about technology at school/at home? And how to use it [how it is used]?

Is there anything that can be dangerous about the internet/gaming?

What do you learn from gaming/the internet?

What would you do without digital items [tools/technology]?

What have you learned about digital responsibility?

What do you think about digital responsibility?

What kind of digital skills might you need in the future?

How can you use this [digital technology] in the future?

What do you think technology will be like in 10 years? What do you think people are going to use it for?

Development of interview questions by teacher candidates

The teacher candidates developed an extensive list of questions for both Grade 7 and Grade 8 students. It is possible that, due to the workshop being a face-to-face event, this opened things up for more intensive work and discussions on developing the research questions as opposed to the shorter lists from the other countries' teams. The questionnaires included questions on things that students learn in school regarding technology, challenges connected to technology use, and future perspectives.

The following are some of the questions the teacher candidates developed:

What tools/devices [digital technology] do you use in your schoolwork, at school or at home? Who taught you how to use them? How long [how many years] have you used digital tools/devices in school? What digital technologies have you used so far in your schooling?

In which subjects do you use digital technology [tools/devices]? How is it used?

Are there many variations between the teachers you have and how they use digital tools?

What is difficult about using digital technology?

Do you feel that your teachers use what you already know with regard to digital skills [technology], in school?

What challenges do you think will come up in the future with regard to digital skills/digital tools?

Do you think all school students have the same challenges when it comes to digital use? Why/why not?

What skills do you think you will use [need] in the future?

Do you have any thoughts about what you want to work with [in the future]/do in 10 years? How do you think you will use the digital skills you learn in school in 10 years?

Do you think that schooling has so far prepared you for the challenges in the future? What would you like the school to teach you?

Core observations video workshop part II: Implementation of the interviews by children and young people and teacher candidates in Norway

The interviews were very successful. There was quite a difference between the length of the interviews between the teacher candidates and the 8th graders, but in general, they went well. We had many participants and all of them wanted to be interviewed. Therefore, we had several rounds of interviews. We had six video cameras (in six rooms) on three different floors, so it was a lively day for all of those involved. The 8th graders' interviews of the 7th graders were typically between 10-20 minutes long and the interviews that the teacher candidates conducted were up to 45 minutes long.

After all of the interviews, we gathered the teacher candidates and the 7th and 8th grade students and had a debriefing session where they could reflect on the day and how they experienced being researchers and participating in research. All of the participants claimed they had enjoyed the day and that they had learned a lot. While it was a long day for everyone, including the researchers, everyone felt happy when they left and felt as though they were able to experience something positive in the midst of another impending COVID lockdown.

Perspectives of children and young people towards addressing what is taught about ICT in school
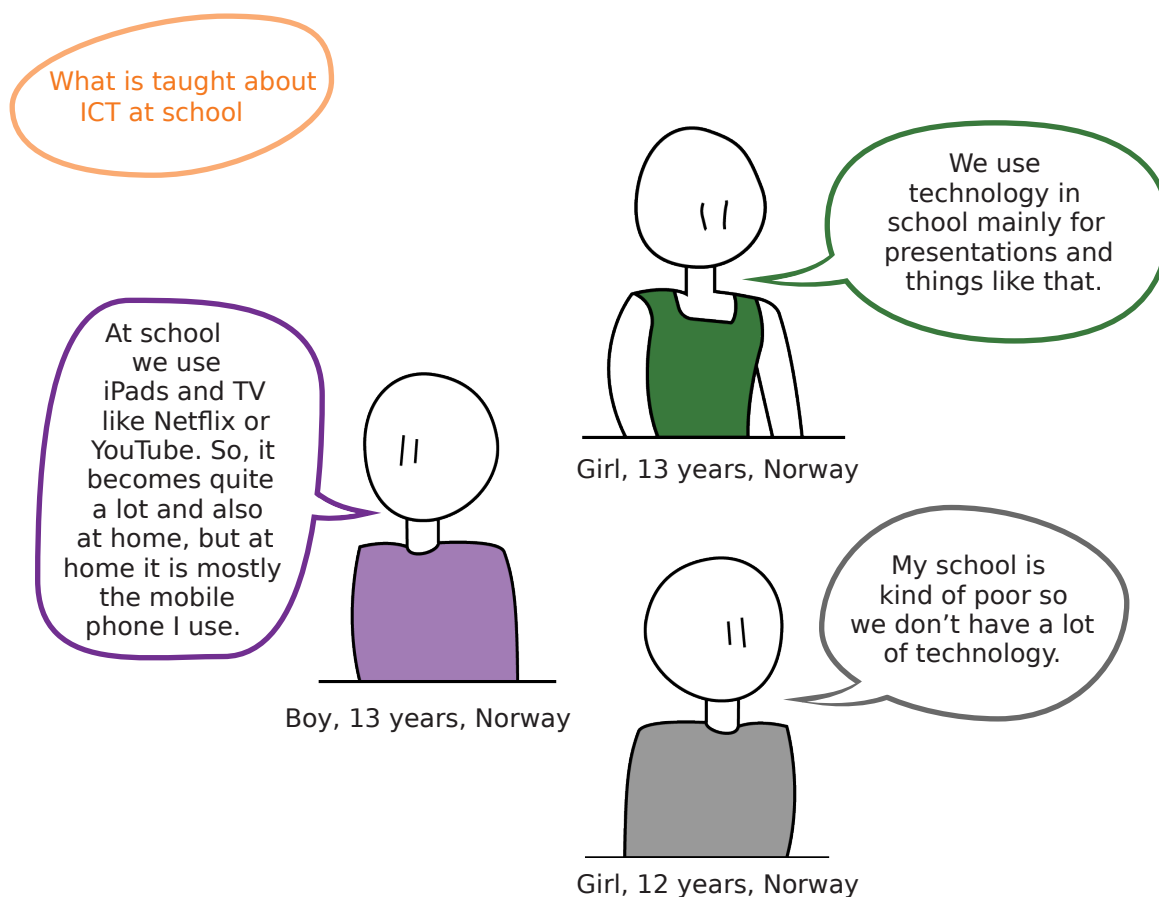
Perspectives of children and young people towards addressing posed challenges using ICT
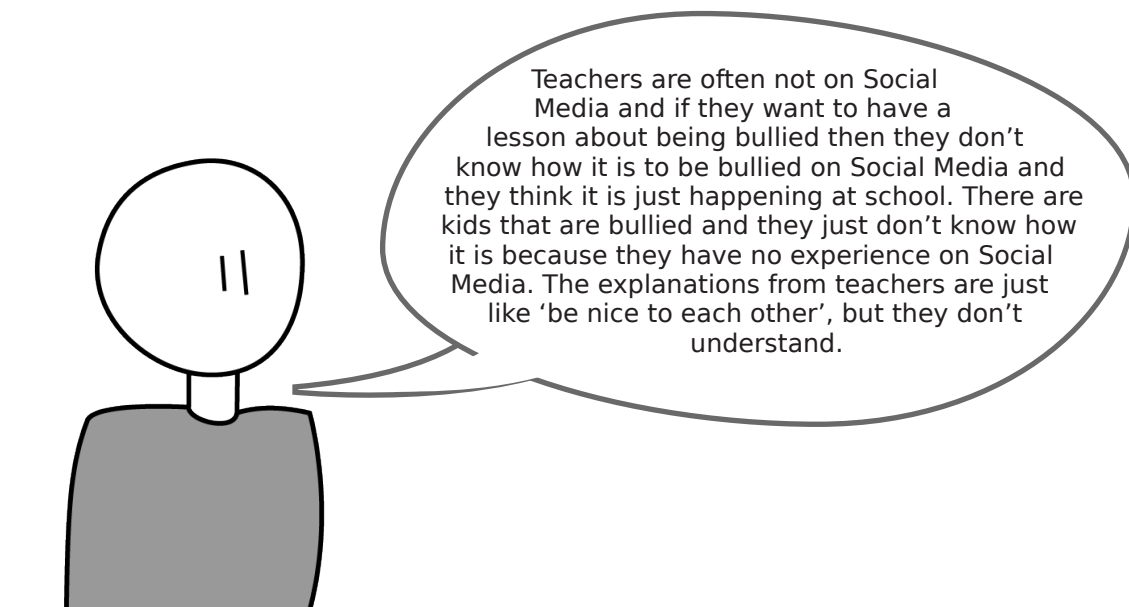
Posed challenges using ICT at school
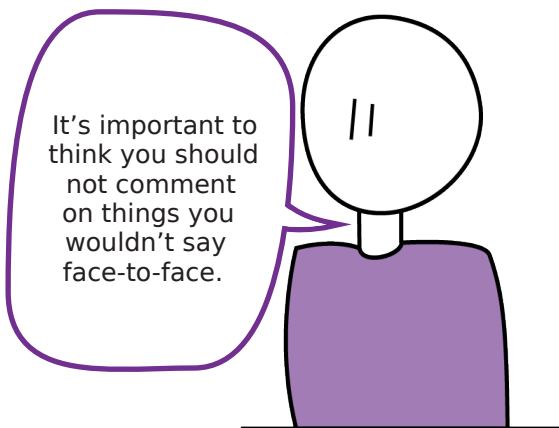
It's important to think you should not comment on things you wouldn't say face-to-face.

If I have a problem I mostly ask my friends for help.

Girl, 13 years, Norway

Girl, 12 years, Norway

Teachers are often not on Social Media and if they want to have a lesson about being bullied then they don't know how it is to be bullied on Social Media and they think it is just happening at school. There are kids that are bullied and they just don't know how it is because they have no experience on Social Media. The explanations from teachers are just like 'be nice to each other', but they don't understand.

Girl, 12 years, Norway

*Perspectives of children and young people towards addressing future digital skills*

Digital skills required in the future

> Maybe I would like to learn a bit more about digital responsibility in the future because I don't really know so much about it other than what it is, but we have not really learned a lot about it.

Boy, 13 years, Norway

> It would be nice to use a little more gaming and stuff like that. A little Scratch and maybe something more practical like VR to learn Greek history and a little more gaming. Then we could really learn a lot. Even those who are the least motivated would be interested to learn.
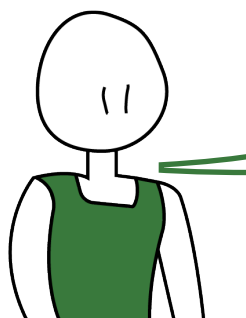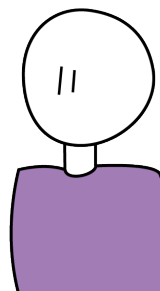
Boy, 13 years, Norway

> Maybe in the future some PCs will have a chip linked to our brains.

Girl, 13 years, Norway

> I think the school needs to help us learn how to find or get back our work if we lose it. You work a lot on something and suddenly it is gone. We have not learned about that.

Girl, 12 years, Norway

Potential conclusions and implications from the video workshop in Norway for further DigiGen research

For the Norwegian research team, it was interesting to organise the workshops during one full day on-site instead of online. On the other hand, it would have been easier to conduct it online in different breakout rooms on Zoom, as this would have avoided the need to think about logistics, camera equipment, etc. Overall, the Norwegian research team found the workshop successful.

Still, it was a bit challenging to get the 8th graders on track in starting to develop the interview questions. By supporting them and giving them example questions, they eventually managed to put together a set of interesting questions for the 7th graders to answer.

It was also very fascinating to notice what the teacher candidates were able to discuss with the children in a way that the Norwegian research team was not able to do to the same extent. This particularly applied to aspects that had to do with digital responsibility issues and eliciting richer information about the topics. Their attitudes and experiences about online bullying, violence, and at-risk behaviour online, which were not discussed in earlier interviews with other participants in the same age group, were interesting and eye-opening for the research team. The teacher candidates managed to bring out some of these types of challenges and the students opened up about their experiences on the matter.

It was much appreciated and a nice experience for those involved as junior researchers. They were excited to participate and felt that their expertise was appreciated. For the 8th graders, it was also a good opportunity to discuss issues with peers their own age but from different schools and from different areas of the capital area.

3.5 Romania

Video workshop recruiting process in Romania

Participant recruitment was moderately challenging in Romania. Recruiting teacher candidates was accomplished with the help of National Stakeholders Committee members who reached out to their extended professional network and put the research team in contact with teachers working in the pedagogy-oriented departments in two urban areas in Romania. All teacher candidates were women, but they differed in terms of geographical location and their professional career track (two of them preparing to teach in primary school, the other two preparing to teach in secondary school).

Reaching vulnerable children proved to be particularly challenging, as COVID-19 restrictions made accessing those particular groups even more difficult. Several teachers who participated in the qualitative WP5 study were able to contact children and their parents for the video workshop. However, only girls were available for the task. Nonetheless, the girls differed in terms of socio-economic background and region (urban and rural).

Teachers or the research team sent consent forms to the parents, and the children's enthusiastic participation was ensured. Teacher candidates were excited about taking part in the workshop.
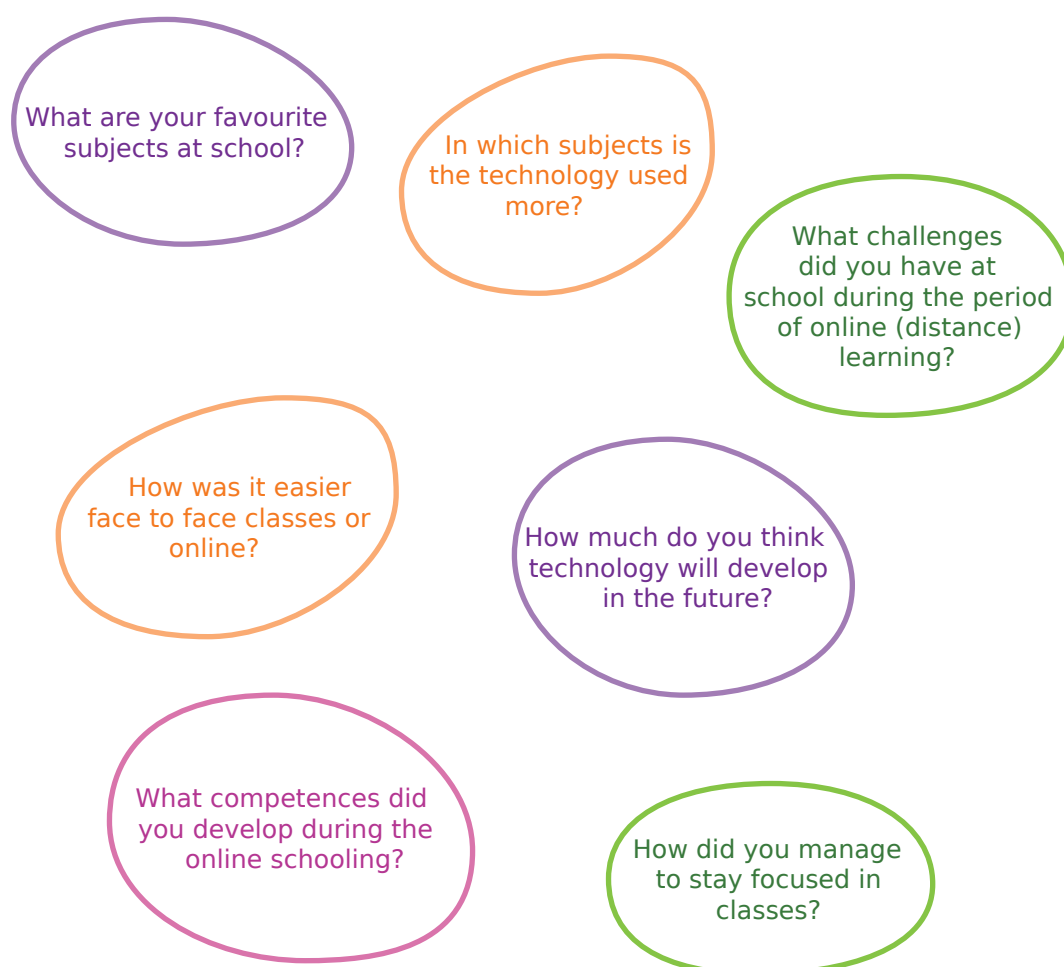
Video workshop setting in Romania

The video workshop, in connection with task 5.2, was conducted solely online in Romania at the end of October 2021 due to COVID-19 safety regulations in place at the time of the data collection. Although the workshop's structure suggested two consecutive days, it proved difficult

to gather all participants, children, and teacher candidates to converge on a common schedule on two days. Therefore, on day 1, we introduced all of the participants to each other, presented the aim and structure of the workshop, and formed the pairs. On the next day, the already formed pairs met individually at commonly agreed times on Zoom and recorded the sessions.

Core observations video workshop part I: Development of interview questions by children and young people and teacher candidates in Romania

Development of interview questions by children and young people

The children's group work (two children, 12 years old) to develop interview questions themselves was accompanied by a researcher to help when needed. This proved extremely useful, as children after the first transition are quite young in Romania (11-12 years old). The two girls were given instructions about the three topics of interest and were left to develop questions on their own. However, they were prompted by the research assistant to add supplementary questions to explore the topics in more depth. Two of the topics proved to raise more difficulties, i.e. the challenges related to digital technologies and future digital skills needed. It was particularly difficult for children to envision how a 4th grader would approach these questions. Some of the questions developed by children are presented below:

What are your favourite subjects at school?

In which subjects is the technology used more?

What challenges did you have at school during the period of online (distance) learning?

How was it easier face to face classes or online?

How much do you think technology will develop in the future?

What competences did you develop during the online schooling?

How did you manage to stay focused in classes?

Development of interview questions by teacher candidates

The teacher candidates developed substantially more questions than the participating children. Also, in the case of the Romanian participants, adapting the language to one that would be suitable for children aged 10-11 was the main challenge. The teacher candidates developed questions for all three topics. They asked questions about subjects taught in school, devices used for different subjects, learning styles, and the meaning of being successful at school. In terms of difficulties and challenges that children encountered, the participants developed questions about difficulties in access and use, but also difficulties in relation to specific school subjects. They also asked about perceived differences between children and on what those differences depend. The questions about the future of digital skills touched on practical aspects, but also on envisioning a future where robots would replace teachers:

What are your favourite subjects? What do you learn there? Why do you like them?

What are the topics where you can best apply digital resources? What are the most attractive?

What difficulties do you encounter in using digital resources for those subjects? (with examples). Are there any difficulties in access/use?

Do you think digital abilities make your life easier? In which aspects? (examples)

Does anyone help you with homework? Does anyone help you with using digital technologies for homework/ school?

What does it mean for you to be successful at school?

In the future, teachers will be replaced by robots, how will school look like for you? Would it be a good idea? A bad idea?

Core observations video workshop part II: Implementation of the interviews by children and young people and teacher candidates in Romania

Conducting interviews and recording various breakout rooms went well. Three of the teacher candidates set up the Zoom interviews themselves and sent the links to the children (the research team helped one of them). The DigiGen researcher helped the two children playing the role of interviewer with setting up the Zoom interviews and recording. Reminders were sent to all participants prior to the scheduled times. As expected, interviews conducted by children took less time than those conducted by teacher candidates. Children gave various responses with regards to how digital technologies prepare them for future life in the digital age.

Perspectives of children and young people towards addressing what is taught about ICT in school

What is taught about ICT at school

All children reported using digital technologies only in relation to their distance learning or blended learning phase. When in school, there were times that only teachers were reported using digital technologies. With reference to the use of ICT for school, the use of tablet computers, desktop computers, laptops or smartphones, and learning apps was reported, e.g. Google Meet, Zoom, Classroom. Children mostly made references to applications and devices that teachers used during the distance learning phase.
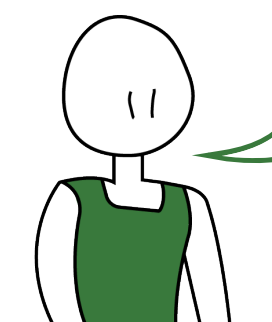
The subjects were much harder to follow online. We mostly used digital technologies for math classes.

In the beginning we didn't know how to share screens, for example, but then we got used to it.
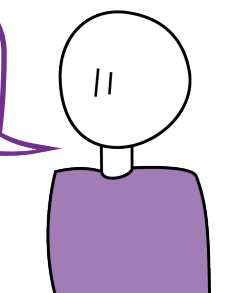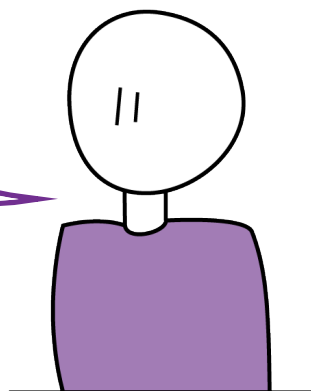
Girl, 11 years, Romania

Girl, 11 years, Romania

Perspectives of children and young people towards addressing posed challenges using ICT

Posed challenges using ICT at school

The challenges posed when using ICT were mostly related to technical issues experienced when connecting or following the lessons online, e.g. problems with connectivity experienced by children or teachers, the teacher's microphone not being loud enough, not seeing the explanations, etc. Other reported challenges were related to parents not fully grasping the potential and usefulness of digital technologies. Some children reported enlisting the help of parents or older siblings in helping them with homework or technical issues, in addition to their teachers.

However, most responses were related to the COVID-19 situation, with children being forced into new learning situations, whether online schooling or "blended" learning. Some reported preferring face-to-face learning, while others reported being tired of wearing masks in schools and thus preferring the online classes. Some children complained about their classmates not paying attention during online classes, while others were grateful for the ability to concentrate better without the noise of an in-person, face-to-face learning situation.

> Many times, the teacher didn't have good internet, so we couldn't hear her, or she would just go offline.

Girl, 11 years, Romania

> My mother doesn't want to understand that some technologies can really help you. I mean, when she sees me with the phone and I have to write, she says… Or when I need to learn, for example, when I was learning for the French class, and I used an app, she left me on my own, she said "Fine, learn on your own!". And then, when she saw I received a 9 mark, she said "Ok, fine, apparently the technology helps you with something!".
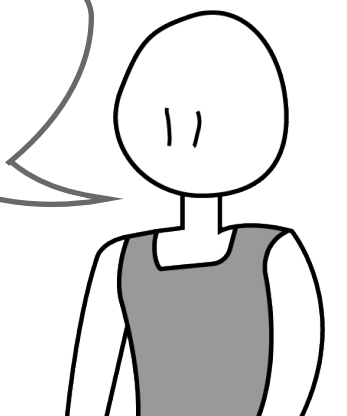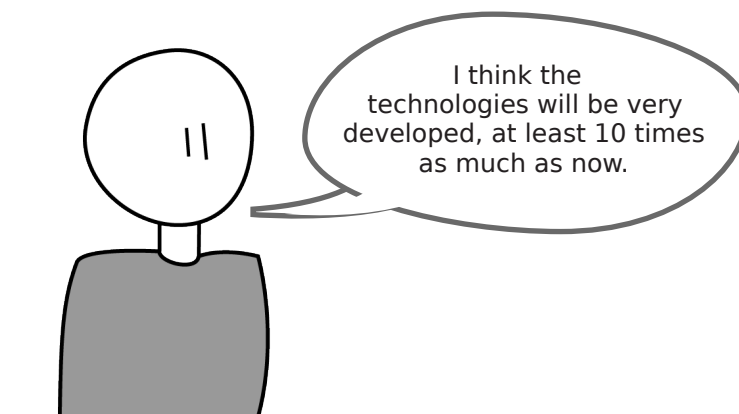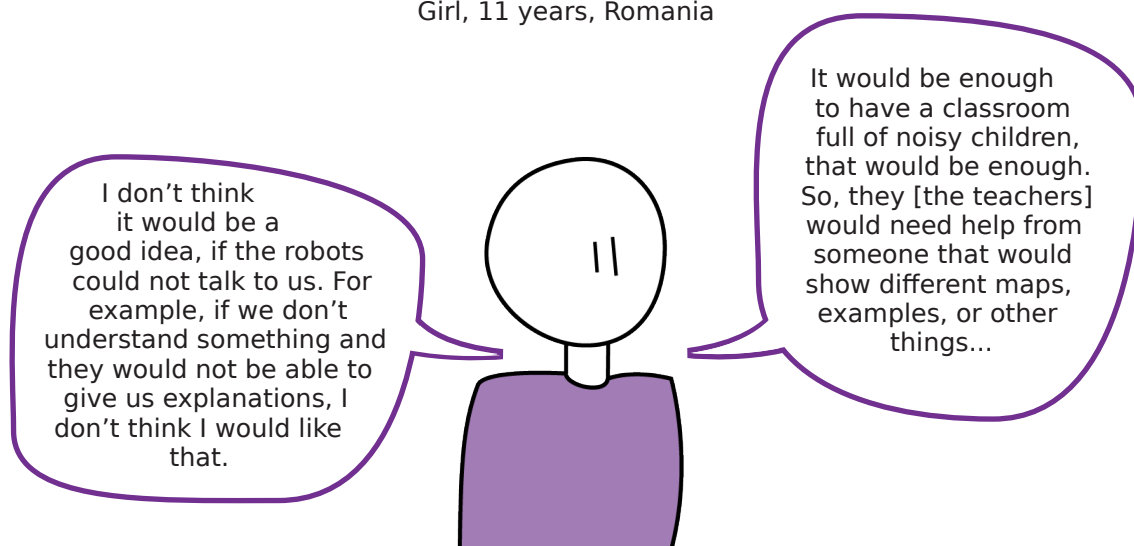
Girl, 11 years, Romania

Perspectives of children and young people towards addressing future digital skills

Digital skills required in the future

Children's and young people's responses regarding digital skills for the future that they want to learn included "to make little games online" (girl, 10 years, grade 4, Romania), and, "I just made one activity using Minecraft. There are still so many things that I don't know yet, but I will definitely learn them" (girl, 10 years, grade 4, Romania). However, one girl was sceptical about the usefulness of digital technologies in the future, saying "They won't necessarily make my life easier, I think I will lose a lot of connections" (girl, 10 years, grade 4, Romania). Children also tried to envision a world where robots would replace teachers.

I think the technologies will be very developed, at least 10 times as much as now.

Girl, 11 years, Romania

I don't think it would be a good idea, if the robots could not talk to us. For example, if we don't understand something and they would not be able to give us explanations, I don't think I would like that.

It would be enough to have a classroom full of noisy children, that would be enough. So, they [the teachers] would need help from someone that would show different maps, examples, or other things...

Girl, 11 years, Romania

Potential conclusions and implications from the video workshop in Romania for further DigiGen research

Overall, the video workshop method was well received in Romania by all participants, children and teacher candidates alike. The feedback was positive, especially from teacher candidates who expressed their willingness to further develop and implement the method in their training and future teaching methods.

With regards to integrating digital technologies in the lives of the most vulnerable children, there is still a significant amount of work ahead, especially related to creating and implementing national level policies ensuring that no child is left behind. Unfortunately, those most vulnerable are also those being left behind in Romania.

Throughout the workshop's entirety, the role of digital technologies was an ambiguous one. Some children seemed to grasp the potential, while others were more reluctant or sceptical, mostly due to the drawbacks and challenges they encountered.

4. Experiences and Implications within the Innovative Method of Video Workshops with Children and Young People for Further Research

Using video workshops in which children, young people, and teacher candidates develop their own questions which they then use to interview other children and young people represents a novel method in which children and young people act as co-researchers. While conducting the video workshops, a variety of implications for further educational research emerged. The main points that emerged are as follows.

The video workshop was very positively perceived.

Overall, the feedback was positive in all countries and the participants seemed to enjoy the experience. They felt that their expertise was appreciated. Also, even the participants (e.g. in Greece) who were shy found the experience very interesting. It was also a good opportunity for the children and young people (e.g. in Norway) to talk with their peers from other schools. The teacher candidates (e.g. in Romania) expressed their willingness to further develop and implement the method in their training and future teaching methods. The method has the potential to be expanded and possibly even implemented in teacher education training and as projects in university courses.

The video workshop requires a high degree of preparation and sensitivity on the part of the researcher.

The amount of preparation is comparatively high. Whether the video workshop took place online on-site made a difference. For instance, organising it online via a video conferencing system does not require camera equipment (as was the case in Norway).

In several countries, considerable differences in the duration of the interviews emerged. While children and young people conducted short interviews, teacher candidates conducted much longer ones.

The recruitment process during the COVID-19 pandemic presented challenges.

Specific challenges in the recruitment process can be identified in all five countries. This is important to keep in mind when conducting a video workshop. It also shows (e.g. in Greece) that children and young people, but also adults who are not familiar with research, do not feel quite comfortable and do not like to join in participatory and interactive activities, especially if the communication was only through digital media and without face-to-face interaction. Successful approaches or techniques could be to involve parents and teachers at an early stage and use personal networks.

Depending on the age of the children and young people, more or less support is needed in question development, decreasing with age.

Above all, the comparatively young age group of children and young people in the role of interviewers (e.g. in Germany and Romania) required a lot of support in question development for the interview guidelines. The children and young people in Norway also needed support

and sample questions to formulate interview questions, while the young people in Estonia, representing the latest educational transition phase and thus the oldest participants aged between 15 and 16, were more able to cope on their own. This aspect should be taken into account when preparing a video workshop.

Taking on the role of interviewer is more challenging than being interviewed.

Young people in Estonia indicated this was the case for them. Unlike interviews that adults conducted, when children and young people conduct interviews, care must be taken to encourage quiet or reserved interviewees to express themselves, creating a space where none of the participants feel put under pressure.

The video workshop has emerged as a beneficial method that reveals previously hidden aspects of how children and young people regard their education in terms of preparing them for future life in the digital age.

The posed questions (e.g. in Estonia) made young people think of new perspectives about which they had previously thought. They may not yet have such a broad understanding to be able to reflect on what digital skills will be needed in the future. Children and young people tended to think about what they would like to be able to do now. While in Estonia they would like to be able to use PowerPoint, Word, and Excel, in Germany, they would like to be able to edit videos and type on the computer. There is no reflection on and concrete link to digital skills considered important in adulthood. Beyond the beneficial aspect of having discussions among peers, interviewers and interviewees being attending school and thus, being subject-matter experts based on their lived experience, it was also a good opportunity to exchange perspectives from different schools, types of schools, and areas. Further, it was also found (e.g. in Norway) that the children and young people were able to discuss topics with the teacher candidates on which researchers had less or no information.

Overall, it can be concluded that the video workshop as a collaborative ethnography method is very advantageous with appropriate preparation. It could be used more often across Europe, if further developed in the future, to engage in research with children, young people, and teacher candidates as collaborators and co-researchers investigating ICT in education.

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Contact:
Prof. Dr. Birgit Eickelmann
Paderborn University
Germany
Email: digigen@upb.de