Young People and Learning Processes in School and Everyday Life 6

Jiří Zounek
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Klára Záleská

Life and Learning of Digital Teens

Adolescents and digital technology in the Czech Republic

Springer

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Preface

This book is the result of a multi-year research collaboration focused on the role of digital technologies in the everyday lives and learning of present-day adolescents in the Czech Republic. The twenty-first century can be referred to as the digital technology era. Contemporary young people are often referred to as the digital generation or possibly the Internet generation, the net generation, and digital natives, who, in contrast to digital immigrants, grew up in the digital age, in which they have had access to various digital technologies from an early age. This book is focused on adolescents, specifically on students, who were 15 years in 2019. We do not use any of the more general terms, such as digital generation or digital natives; we present specifically digital teens, and we map the various ways in which digital technologies affect their lives and learning.

The topic of life and learning for young people in the twenty-first century is not unique. It has been the subject of many research projects, expert studies, and monographs. Digital technologies have become one of the basic building blocks of present-day society, culture, and everyday life. Young people today grow up in a world in which digital technologies represent a regular and natural part of almost every aspect of their lives. The topic of digital technologies is being increasingly established in the field of school systems and education. Digital technologies have influenced the life of schools and of many after-school institutions significantly; they are part of the "workshops" for teachers, and the problems associated with using digital technologies in education present a significant challenge in the education of future teachers in various types and stages of schools. The topic of digital technologies also resonates strongly in the field of education policies, both within individual countries and on the international level.

Digital technologies play an important role in the lives of young people today in connection to entertainment and leisure time, but also in the context of school, in learning, and in everyday interactions with classmates and peers. The problems of digital technologies make up an unbelievably varied mosaic in the lives and learning of young people, opening countless topics and questions for empirical research. We hope that our book will contribute some stones to this expanding and vibrant mosaic.

In contrast to earlier publications and studies, this book discusses the topics of adolescent life and learning with digital technologies in several unique ways. The book presents the results of research aimed at investigating and describing how digital technologies enter the everyday lives and learning of adolescents across various contexts and environments. In comparison to other studies focused on one specific context, typically the school, we used a holistic approach and we focused on various contexts and on the manner in which they merge and overlap each other's borders. We used several sources of empirical data to capture this complexly conceived phenomenon, which can be understood as another innovative element of our research and this book. We combined both qualitative and quantitative methods of research to better acquaint ourselves with the daily life of teens. At the same time, we listened carefully to the opinions of teens. This book is also unique in its focus on the lives and learning of adolescents with digital technologies in Central Europe, specifically in the Czech Republic, one of the countries whose modern history was notably scarred by the totalitarian communist (socialist) regime. One important topic of our book is thus the problems of post-socialism, especially with regard to whether and to what extent this history plays a role in the questions and topics of today.

The goal of this book is to improve the knowledge in the field of digital technologies in the lives and learning of young people today. Our research was inspired by many studies from other countries, and we included the results of international studies so that readers can form an idea of the life of young people in the Czech Republic and also consider the similarities and differences between our results and the results of previous studies. Therefore, this book is intended especially for readers who are interested in considering the topics of digital technologies in wider cultural, social, political, and economic relations, which we believe can provide new and inspirational insights into the current and future roles of digital technologies in the lives of adolescents, in school education, in teacher preparation, and in lifelong learning in the digital era.

Brno, Czech Republic
August 2021

Jiří Zounek
Libor Juhaňák
Klára Záleská

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The research project and this book could never have been completed without the cooperation of several families, particularly the young people, who spent quite a lot of time with us. They let us peek into their private lives, for which they deserve great thanks.

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Contents

List of Abbreviations

BYOD	Bring Your Own Device
CSI	Czech School Inspectorate
CZE	Czechia / the Czech Republic
DES	Digital Education Strategy
DESI	Digital Economy and Society Index
EU	European Union
FEP	Framework Education Program
GDP	Gross Domestic Product
HDI	Human Development Index
ICILS	International Computer and Information Literacy Study
ICT	Information and Communication Technologies
ILSA	International Large-Scale Assessments
ISCED 0	Nursery schools (pre-primary schools)
ISCED 1	Primary schools (elementary schools 1st stage)
ISCED 2	Lower secondary schools (elementary schools 2nd stage)
ISCED 3	Higher secondary general schools, secondary vocational schools
ISCED 5	Conservatoires
ISCED 6	Bachelor's degree programs, tertiary professional schools
ISCED 7	Master's degree programs
ISCED 8	Doctoral degree programs
LMS	Learning Management System
MEYS	Ministry of Education, Youth and Sport of the Czech Republic
OECD	Organisation for Economic Co-operation and Development
PISA	Program for International Student Assessment
PPS	Purchasing Power Standards
SAO	Supreme Audit Office
SEP	School Education Program
SITES M2	Second International Information Technology in Education Study Module 2
TALIS	Teaching and Learning International Survey
UCS	Union of Computer Specialists
VLE	Virtual Learning Environment

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About the Authors

Jiří Zounek is an associate professor at in the Department of Educational Sciences, Faculty of Arts, Masaryk University (Czech Republic). He focuses on the history of Czech pedagogy and school systems in the twentieth century and on the use of digital technologies in education. In the past 10 years, he has been a grantee or a project partner in several research and development projects. From 2017 to 2019, he was the main researcher on the research project *Digital technologies in the everyday lives and learning of students* (Czech Science Foundation, 17-06152S). From 2014 to 2016, he was the grantee of the research project titled *Everyday life of basic schools in the normalization period as seen by teachers: Applying oral history to research in the history of contemporary education* (Czech Science Foundation, 14-05926S). He is the author or co-author of books about ICT in primary schools, teachers and technology, tablets in education and e-learning, and the history of Czech primary schools in communist Czechoslovakia. He was a member of the large team responsible for the Czech National Strategy for Digital Education 2020. He publishes the results of his work in scientific journals and presents them at conferences such as the European Social Science History Conference, European Conference on Educational Research, and the International Conference of Education, Research, and Innovation. He is a member of the Czech Oral History Association and a member of the Czech Association of Educational Research (member of European Educational Research Association). He is also a member of the Science Advisory Board (SAB) of the vice rector for research at Masaryk University.

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fields of pedagogical research, including *Digital technologies in the everyday lives and learning of students*, *Educational Trajectories of Non-traditional Students: Stories Behind Numbers*, and *Career adaptability of vocational upper-secondary school graduates during the school-to-work transition*.

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Chapter 1
Introduction

Digital technologies and their role in the everyday life and learning of present-day teenagers are the main topic of this book. The content is based primarily on the results of a research project conducted over several years in which this topic was the central focus. We introduce the research design and project methodology in more detail in this chapter. In the course of writing of this book, we also built on our previous studies concerning digital technologies in education. These include studies on digital technologies in the life of primary schools and in the work of principals and teachers in primary schools (Hrtoňová et al., 2015; Zounek, 2006; Zounek & Šeďová, 2008; Zounek & Šeďová, 2009) and studies focused on the problems of e-learning in general (Zounek et al., 2016). We also followed up on studies focused on the options for researching learning in various online educational environments (Juhaňák & Zounek, 2016, 2019). This book can therefore be understood as a further research path for our focus, as we have focused on digital technologies only in connection to formal education in our previous studies. In this respect, this research represents not only a follow-up to our existing line of research projects and topics, but also, in many aspects, an expansion of the research field.

Our main goal was to research the role of digital technologies in the everyday life and learning of present-day teenagers across various contexts and environments in which the teenagers use digital technologies. Specifically, we focused on fifteen-year-olds living in the Czech Republic, one of the post-socialist countries of Central Europe. At this point, we could end the basic introduction of the topic of the book and go straight to the subsequent chapters. However, we believe that it is appropriate or even necessary to introduce the individual key terms at least briefly and to set them into the wider context of the topic and the book as a whole. The following paragraphs briefly introduce the basic key terms used in this book, offer a description of the research design and project methodology, and present an outline of the book organization and its individual chapters.

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Of course, *digital technologies* are the first key term of the researched topic. In its basic meaning, the term *digital technologies* can be understood as all technologies and tools enabling the use of digital data or information, especially creating, transmitting, sharing, storing, displaying, or exchanging information (for more details, see UNESCO, 2013; Zounek & Šeďová, 2009). For the sake of simplicity in this book, we consider terms such as *digital technologies and information and communication technologies* (ICT) to be synonymous. At the same time, we believe that digital technologies cannot currently be understood only within a narrow meaning of the term, as specific tools or aids used by people. This view has a wider meaning in our concept, within which digital technologies create an independent world, context, or sphere of being for present-day people. Digital technologies create new and continuously expanding (online and virtual) environments for work, learning, communication, free time, and other aspects of life. Many (previously separated) spatial and temporal aspects of life are gradually losing their importance in this environment. In addition, present-day young people from developed countries have been growing up in this specific environment in which digital technologies are commonly available and virtually "omnipresent" since the day they were born. Therefore, if we are interested in the issue of the use of digital technologies by young people, we must realize that young people today live in both the physical and the virtual environment completely naturally, or rather in one world consisting of two mutually connected parts (Lankshear & Knobel, 2006).

The fact that children are starting to use digital technologies at increasingly earlier ages was confirmed by the EU Kids Online research (Holloway et al., 2013). This research also pointed out that not all children use digital technologies to the same degree. In the same way, the research results have clearly shown that children differ in the specific digital technologies they use as well as understandably in the activities they perform with digital technologies. Digital technologies are not only a source of entertainment for the children; they also represent a source of information and a learning aid (Chaudron, 2015; Kontríková et al., 2015). Therefore, children and young people have very different experiences with the use of digital technologies. Not all children are digital technology enthusiasts; others may be much more advanced users than their parents, grandparents, or even schoolteachers. In any case, digital technologies have become not only a component, but rather a significant formative element of the everyday lives of children and adolescents. To research the role of digital technologies in the life and learning of present-day teenagers, it seems unbelievably productive to focus on the everydayness, everyday life, and learning with digital technologies.

Given that our background lies in the field of educational sciences, *learning* can be considered the next key term of the researched topic and of this book. In this aspect, sociocultural learning theories, which on one hand emphasize the effect of culture on both the content and the process of learning and development (van Oers, 2008) and on the other hand consider interpersonal interactions (Vygotskij, 1976a, b) to be key, played a very important role in this research. Gauvain (2001 in van Oers, 2008) emphasized the sociocultural context, which plays the decisive role in the formation of opportunities for a person's development. According to these

theories, the human self is dependent on its sociocultural existence and is formed by cultural tools, and therefore also by digital technologies. If we then consider the contemporaneous forms of life and learning of present-day teens (and their parents), we then proceed from a sociohistorical theory emphasizing that the learning process and the concept of teaching transform in time in connection to transformations of culture. The ways in which people learn depend on the culture and time in which they live (van Oers, 2008). Therefore, the question is how new cultural tools can affect or change human behavior (Wertsch, 1998). Wertsch claimed that human behavior is "mediated" by the use of tools within social activities. Digital technologies represent an important cultural tool (or a group of partial tools), and it is therefore necessary to consider and research the social and cultural consequences of their use. Digital technologies should not be viewed as a mere continuation of previous technologies (such as television) or traditional school aids, but rather as devices changing and transforming the formation and adoption of knowledge, forms of communication, and generally ways of human interaction (Erstad, 2011).

School automatically comes to mind in connection with learning and education; we pay a corresponding amount of attention to it in this book. Large international studies such as the Program for International Student Assessment (PISA) and the International Computer and Information Literacy Study (ICILS) offer very valuable information on the issues of digital technologies in school and in student learning. The *Students, Computers and Learning: Making the Connection* report (OECD, 2015) provides information on fifteen-year-old students' access to computers both at home and in school, on the use of computers for activities in school, and on the relation between student socioeconomic status or place of residence and their access to the internet. The study also warns of the unused potential of ICT in education as well as of the potential threats that digital technologies bring into student life. The results of the ICILS research show that school plays an important role in the acquisition of knowledge and skills in the field of computer and information literacy; at the same time, they show that informal learning is also of great importance in this field in the lives of young people (Basl et al., 2015a, b). The PISA and ICILS studies thus offer huge amounts of very valuable information and knowledge on the issues of digital technologies. At the same time, their focus primarily concerns the context of school and formal education, which can be considered a certain limitation in this aspect. However, both studies clearly show that digital technologies are an integral part of every day for the respondents; they also voice a rather clear message on school not being the only place where young people acquire digital literacy.

One of the main motives of our research was to complement the existing PISA and ICILS research results with more in-depth research of the learning processes of young people with digital technologies, and also to go beyond the topic of formal education and learning in school and to focus on (informal) learning in the daily life of present-day teenagers. In this aspect, the concept of *learning lives* (Erstad, 2012, 2013, 2015; Erstad et al., 2009; Erstad & Sefton-Green, 2013) was key, and it had a significant impact upon the formation of our considerations over the topic toward a more complex view of digital technologies and their role in the life and learning of present-day teens (Arnseth et al., 2016). The word *life* is important here and it can

be understood to mean the daily life of present-day young people. Because of the concept of learning lives and the studies based on this concept, we realized that a part of the existing (Czech) pedagogical research focused on digital technologies overlooks one important matter, which is the fact that learning in school, even if accomplished using the best or state-of-the-art digital technologies, is but a single part of young people's lives with digital technologies. It is undoubtedly an important part of their lives, since they spend rather a lot of time in school and school has a significant influence on a number of aspects of life, even in the field of digital technologies. Nevertheless, the lives of young people with digital technologies outside of school, with peers, family, friends, in online environments, etc. is no less important.

Adolescents, specifically their everyday lives, are therefore another key topic of the book. The term *adolescence* (see for example Macek, 2003; Steinberg, 1989) is crucial for us. However, some of our considerations are focused on younger adolescence and on childhood. In the text of the book, we use terms such as *young people*, *youth*, *teens*, and *teenager*, which we understand to be synonymous with the term *adolescent*, unless stated otherwise. In addition, in our research sample (see below), we usually speak about adolescents at the age of fifteen, particular in regard to our respondents. In the text, we use the terms *child* or *children* to indicate a parent-child (offspring) relationship. We also use the terms *child* or *children* in the sections of the book that focus more generally on the problems of childhood and adolescence. We focus specifically on Czech adolescents, who are admittedly part of Euro-American culture, but who also live in a Central European country where the search for a national identity has been an important question (Holý, 1996), especially after the fall of the Communist regime in 1989. Czech adolescents share many features with their peers from other developed or Western countries. They use the same digital technologies, listen to the same music, watch similar movies or television series, choose clothing of the same brands, and so on (Macek et al., 2013). On the other hand, there may be some specific characteristics given by the historical experience mediated to them primarily by their parents, teachers, and other adults who lived part of their lives under the totalitarian regime prior to 1989.

We focus on the various aspects and contexts of the everyday life of adolescents in the book. However, *home and family*, which certainly are of fundamental importance in young people's lives (Horst, 2010), remain the main context and topic of our focus. By the term *home*, we mean not only the physical location (even though we have paid attention to physical aspects, specifically the arrangement of the household); we understand it as a social construct including family values, routines, structures, shared history, etc. At the same time, we try not to focus on the home and family as on an independent and separate context detached from other contexts in which the lives of present-day young people take place. On the contrary, we always strive for a holistic view on the given topic, meaning that we are trying to bridge and interconnect various contexts. In connection with home and family, we focus mainly on the relationship between home and school; this relationship represents more than a mere connection of two different physical locations, it is also the meeting of different social and cultural constructs (Grant, 2010). Students bring values, abilities,

enthusiasm, worries, and interests from the world outside of the school into classroom. At the same time, student learning is not strictly limited to the time spent in school. Students also learn at home, when they work on their homework, for which they can use or have to use digital technologies. The use of skills, abilities, and experiences in the field of ICT acquired in school in everyday out-of-school activities (including informal learning) is less visible. Students' lives outside of school bring various kinds of opportunities and challenges that expand their learning experiences in school.

In connection with digital technologies and the family, it is necessary to pay attention to parents. For children, the *parents* are doubtlessly an important or even the key source of information on the world of digital technologies. Their approaches, opinions, abilities, or real behavior in the use of digital technologies have a great impact upon the experience and knowledge of students in the field of digital technologies (Grant, 2009; Chaudron et al., 2018; Smahelova et al., 2017). Even though adolescents do not spend as much time with their parents as the previous generation of adolescents did, the parents have a significant influence over the lives of the young people, for example in their emotional well-being and value orientation, and also in the field of education and their choice of future profession (Macek et al., 2013). Dependence on adult authority has decreased in the last two decades, which fundamentally affects the way of life of present-day adolescents. The adolescents' emphasis on autonomy and self-regulation has increased, and free and open communication with peers and adults alike is more important in the lives of young people. Changes and overall openness to new influences related to the introduction of digital technologies into the life of adolescents have brought greater diversity into their lifestyles (Macek et al., 2013).

The specific *topic of post-socialism* connected to the Czech Republic, where our research was set, appears especially strongly in connection to the topic of parents. The lives of parents, and in the end even the lives of the adolescents themselves in our research, have certainly been affected by the history of the last several decades, reflecting the transition from a totalitarian to a democratic regime. Some parents were already adults before 1989, that is, in the period of socialism. The Czech community has undergone many changes since 1989, including transformations in the perception of childhood and adolescence. Some studies show that there are differences between childhood and its perception in the socialist and post-socialist periods. According to Nosál's research (2002), the socialist childhood is connected to addiction, manipulability, and ignorance. The socialist childhood further included collective life and intensive social contact, but also low individual self-confidence and school fear or traumas. Little or no choice and simplicity of life ("everything was clearly planned/given"), as well as a safe and calm environment, were also characteristics of the pre-1989 childhood in Czechoslovakia. On the other hand, according to Nosál (2002), the post-socialist concept of childhood is characterized by autonomy, self-confidence, individualism, sometimes even loneliness, diversity (social differentiation, various family environments), passive consumption, liberal upbringing, larger appreciation of various options and choices, and the necessity to choose among various lifestyles, free-time activities, etc. This is of course reflected

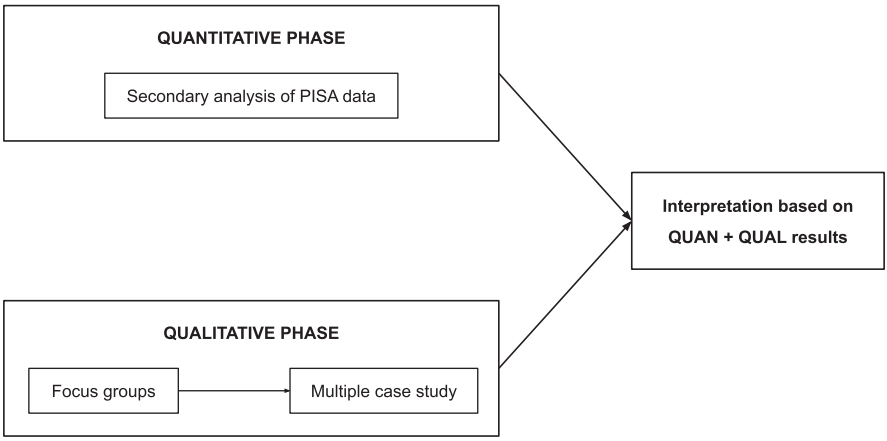

Fig. 1.1 Visualization of the research design

in general in the relationships between parents and children, and also in the parents' approach to digital technologies, in the role digital technologies play within the household, and in the way present-day Czech parents view the use of digital technologies by their fifteen-year-old children.

The research project that was the cornerstone of this book aimed to research and describe in detail the ways in which digital technologies affect the everyday life and learning of fifteen-year-old students in various contexts and environments in the Czech Republic. The research project was based on a mixed design within which two basic phases took place in parallel: a quantitative phase and a qualitative phase. We followed Creswell et al. (2003) in a "concurrent triangulation design" in which the quantitative and qualitative methods are of equal importance (see Fig. 1.1). The quantitative phase consisted of a secondary analysis of data from international large-scale assessments (ILSA) performed in the Czech Republic. Within the qualitative phase, we performed a sequential collection of data that started with creation of several focus groups with adolescents and continued with a multiple case study. This research design, integrating various data collection techniques, allowed us to acquire complex data to fulfill the set goal.

Secondary Analysis The quantitative phase of the research consisted of the secondary analysis of ILSA data in the Czech Republic. Specifically, we focused on the secondary use of data from the ICILS research from 2013 and the PISA studies from 2015 and 2018. Admittedly, both of these large studies primarily focus on a different topic (computer and information literacy in ICILS, and mathematical, reading, and scientific literacy in PISA), but at the same time they offer large amounts of data that can be used within secondary analyses. The use of these data and the secondary analyses occurred only as an exception in the Czech Republic, which was one motive for the secondary analysis of the ILSA data. Our attention was focused on the data from the PISA research because of their recency and

because the PISA research included a questionnaire specifically focused on the issues of digital technologies and their use by students ("ICT Familiarity Questionnaire").

As both the ICILS research and the PISA research used relatively complex designs resulting in data of various levels (student-level data and school-level data) and from various respondents (students, teachers, and principals), the processing of data required advanced analytical and statistical techniques. Primarily, with regard to the hierarchical character of the analyzed data, "multilevel modeling" had to be used in all analyses (see Heck & Thomas, 2015; Hox, 2010; Snijders & Bosker, 2012). This method can manage work with data of various levels. We primarily analyzed the data on the student level while taking into consideration that different students come from different schools, which of course affects various characteristics. Especially in recent years, multilevel modeling is being used more and more often in pedagogical sciences, and in psychology, sociology, and other social science fields. We performed the data analysis itself in the R statistical software (R Core Team, 2018) using the BIFIEsurvey library (BIFIE, 2018).

Focus Groups The analysis of data from the ILSA research allowed us to acquire a lot of information on digital technologies and their use by students, but it did not make it possible to find out how the students think about the use of digital technologies in everyday life in formal and informal learning. In the same way, it could not provide us with knowledge of the students' ideas about school and the roles of ICT in school or formal learning, or possibly of the interconnection between formal learning and virtual learning. Our research thus included a qualitative phase. In this phase, we first created three focus groups (Babbie, 2013) with fifteen-year-old students from three different schools in the South Moravian region in the Czech Republic. In all cases, we received permission to perform the research from the school principal and from the class teacher. The students and parents were informed about the research in advance. To a certain degree, the creation of focus groups served as the pre-research of the qualitative phase (i.e. multiple case study), since we aimed to acquire more accurate ideas of the students and their opinions of ICT both in and out of school.

Within the focus groups, we encouraged the students to think about their ideas of school in the digital age. We used the projective method (Pelikán, 2011). Two model situations were presented to motivate the students to a discussion in the focus groups. The first model situation led the students to think about the possible personal benefits of the use of ICT. The situation was formulated in the following way: *What do you say to your parents to convince them that ICT are beneficial for you and to show them all the things you can use ICT for?* The second situation stimulated the students to discuss their ideas of a school in which various ICT are used (including computer games, on-line applications) in many ways. The wording of the question was: *What would school be like for you if computer games, social networks, and exercise books on the Internet were used in teaching?* (Neuwirthová, 2013). The analyses of the collected focus groups were performed in the Atlas.ti

environment, in which we identified the main topics that the adolescents thought about in connection to digital technologies. These findings were the point of origin for the next part of the qualitative phase of the research.

Multiple Case Study In the second and dominant part of the qualitative phase of the research, we performed a multiple case study (Stake, 1995; Yin, 2003) of fifteen-year-olds. It involved a total of six cases. In our research, a "case" was a fifteen-year-old person living in South Moravian region of the Czech Republic. The examples were selected gradually in relation to the research intention. After an evaluation of the first case, the subsequent cases were selected to either support and expand the first case or to contrast with the first case. The selection of cases was intentional because the PISA international research from which we used data for the quantitative phase focuses on the same age group. One reason for choosing fifteen-year-old respondents was the fact that they have almost completed primary school and therefore they already have a rather long-term experience with digital technologies (see OECD, 2015). In addition, given their age, they are able to verbalize this experience. Apart from the criterion of age (fifteen years of age), we also selected adolescents into the sample according to the address of their place of residence, school type, and family socioeconomic status. With this choice, we attempted to encompass the widest possible palette of Czech adolescents. Our intention was not to search for extreme cases (extreme poverty, extreme wealth, or extremely bad grades, etc.); rather, we tried to acquire a palette of "typical" Czech adolescents. With regard to the place of residence (large city or small village), school (private school, public school, or selective school) and family socioeconomic status (lower middle class, middle class, or upper middle class), our sample can be considered very heterogeneous. At the same time, from a macro perspective, it can be considered a sufficiently homogeneous sample (this concerns adolescents in a certain space-time in which all of them reached the age of fifteen in the given year and they are growing up and living in the same country, etc.). Therefore, the sample is sufficiently varied to provide a plastic view of the situation while its homogeneity simultaneously allows observation of shared formulas and strategies arising from the shared culture and the historical context. For more detailed characteristics of the interviewed adolescents, see Table 1.1. In addition to family background, the adolescents' satisfaction with ICT use both at home and in school was assessed.

We conducted the case studies in the fall 2018 (October to November) and spring 2019 (March to May) in order to not overly impact the family life or school attendance (i.e., not at the time of holidays or vacations, and not during the school exam period). In the case studies, the in-depth interview with the student was the main data collection technique. There were two interviews with each adolescent. The first interview focused on the current situation and on personal history, and it included ideas about future. A specimen record, into which the adolescents recorded their daily activities for the period of one week after the first interview with an emphasis on the use of digital technologies, was also used to collect data within the case study. This method made it possible to describe and explain how, when, and with

Table 1.1 Characteristics of respondents

Name	School Grades	Siblings	Living situation	Leisure activities	Satisfaction with use of digital technologies in school	Satisfaction with use of digital technologies at home
Natalie	State school Average	One younger brother	Divorced parents; lives with her mother, step-father and a younger brother in a smaller flat	Formerly floorball (injury)	High satisfaction	Medium satisfaction Wishes to spend a little less time with digital technologies
Alice	State school Poor	One older step-sister	Lives with adoptive parents in a house	Playing music instruments	High satisfaction	Low satisfaction Wishes to spend twice as much time with digital technologies
Petra	Grammar school Average	One older brother	Lives with both parents in a house	Studying has replaced all leisure activities	Medium satisfaction Thinks they should use digital technologies less often	Medium satisfaction Wishes to spend a little less time with digital technologies
Matej	Grammar school Good	Two older sisters	Lives with both parents and sisters in a flat. Religious (Christian) family.	Table hockey competitively, cycling	High satisfaction	Low satisfaction Wishes to spend much less time with digital technologies
Renata	Private primary school Good	One older sister One younger brother	Rather wealthy family. Lives with both parents and siblings in a house.	Hanging out with friends	High satisfaction	Medium satisfaction Wishes to spend a little less time with digital technologies
Jiri	Grammar school Good	One younger sister	Lives with both parents and sister in a single-family house	Studying, temporary jobs	Medium satisfaction Thinks they should use digital technologies more often	Low satisfaction Wishes to spend half the current time with digital technologies

what goals the ICT were used in the context of a regular week and in what way these activities constituted a part of the everyday lives of the adolescents. The second interviews took place after the week of recording the adolescents' activities; that record was the primary basis for the second interview. The second interview took the form of a collaboration (Gubrium & Holstein, 2001) in which both the interviewer and the participant in the research collaborated on the formation of meaning. The interviews also included an observation of the home environment where the respondent studied and the technique of thinking aloud, in which the students for example presented the resources used for studying and their manner of use or the times and reasons for using digital media etc. in the course of the interview (Branch, 2013). During the visits, the researchers also made field notes from their observations, focused on the usual locations where the student/respondent used ICT, on the types of activities performed with digital technologies, and on the specific activities in the course of which ICT was used. The case study also included an interview with the parents, aimed at acquiring a wider context of the everyday life of the student as well as the parents' views on digital technologies in family life and in their private or work life. A total of twelve interviews with the adolescents and six interviews with parents were conducted. All of these interviews were recorded on a voice recorder and subsequently transcribed and analyzed.

Data material acquired in the in-depth interviews underwent open coding and subsequently other analytical procedures developed within the anchored theory (Corbin & Strauss, 2015). The analysis was performed using software for qualitative data analysis (Atlas.ti). All of the methods used were aimed at acquiring detailed and complex knowledge and understanding of each individual case, and to find or identify behavioral patterns or views with regard to the researched environment.

The book begins with the chapter *Education, Life, and Digital Technologies in the Czech Republic: The Story of a Post-Socialist Country in Central Europe*, in which we briefly introduce the Czech Republic, its history, economy, and changes in education after the fall of the Communist regime in 1989, which was one of the fundamental milestones in modern Czech history. Even though the Communist regime represented a decline in the field of technological development, interesting experiments and thoughts on the use of the then-current technologies in education can be found even in this period. The chapter contains a description of the school system in the Czech Republic, and we introduce the largest curricular reform after the fall of the Communist regime, from 2004. We focus primarily on the development and the condition of the education policy in the field of digital technologies, but we also mention some remaining steps. We describe and explain the fulfillment of political goals and the implementation of the proposed measures into educational practice, one of the important frameworks of our research. We especially show that the inclusion of digital technologies into education and social life is an important topic in the Czech Republic at the moment. Nevertheless, the fulfilment of the set visions and the implementation of strategies into everyday reality constantly face many challenges.

The book has three parts that simultaneously show the key contexts of our research in the lives of present-day Czech adolescents. We focus on digital technologies in the context of school (Chaps. 3 and 4), in the context of family (Chaps. 5 and 6), and in the context of their everyday life (Chaps. 7 and 8). We gradually introduce the focus of the individual chapters in the following paragraphs.

Chapter 3, *Teachers and Their Use of Digital Technologies in School*, represents the first of the important life contexts of both present-day young people and our research: the school. Not only do students spend a large part of their time in school, they also encounter digital technologies here. We look into the school life in more detail while focusing on the manner in which Czech schools are equipped with digital technologies, on how teachers use them in their lessons, and on the teachers' skills and abilities to use digital technologies in teaching. We are of course also interested in the ways in which the teachers think about digital technologies and their use in teaching and learning. The options of ICT in teaching and education subsequently led us to consider new approaches to teaching including digital technologies and simultaneously deviating from the traditional teacher-centered concept of teaching to new approaches, which we refer to as *twenty-first century education*. If we focus on the students' results, then in the new educational concept, the most important are the skills and abilities that allow the students to fully live in the present-day society. These include creativity, critical thinking and problem solving, the ability to cooperate, and a mindset ready for lifelong learning. We do not limit ourselves to the viewpoint of qualitative studies in this chapter, neither on the national nor on the international level; we let the students themselves speak as well. We present the results of relevant quantitative assessments (primarily the ICILS research) and then we describe how the students perceive the given field on the basis of our own qualitative research. We are primarily interested in how the students evaluate the school equipment, what they think of teachers' ability to use digital technologies in education, and how they perceive teachers' use of ICT directly in lessons.

Chapter 4 is *The Availability and Use of Digital Technologies in Relation to Student School Performance*. In this chapter, we follow up on the previous topic by focusing on the degree to which the availability of technologies and their use by present-day Czech adolescents influences their performance in school. Even though digital technologies are one of the key topics both in the current pedagogical research and within regular school practice, there are still many ambiguities about the actual impact of digital technologies and their use on the education results. In addition, it clearly visible that the existing research has not yet provided unambiguous answers to questions about the connections between the availability and the use of digital technologies and the educational results of the students. Therefore, it is necessary to strive for better mapping and understanding of the role of digital technologies in connection to the school results of the students. In this chapter, we describe and explain how the availability and use of ICT by students both in and outside of school is reflected in their school performance. We used the data from the

PISA 2018 research for these purposes. Using multi-level modeling, we identified various factors concerning the availability and the use of ICT that are related to the performance of students in school. Within the analyses, we focus on the availability and the use of digital technologies directly in school and on the availability of the use of digital technologies by students in their home environment. Apart from the use of digital technologies in general, we focus specifically on the frequency of Internet use. We pay attention to other aspects related to the use and the role of digital technologies in adolescents' lives, such as the interest in digital technologies or the perceived ability and independence in their use.

In Chap. 5, *Home Use of Digital Technologies by Teens: The Role of Family, School, and Peers*, we refocus our attention from the school to the family context. The use of digital technologies is undoubtedly an important part of life of most present-day adolescents. At the same time, it is necessary to realize that even though the present can be seen as a "digital age" and it may seem that digital technologies are available almost universally, some differences in access to ICT, and, above all, the degree and manner of ICT use across various groups of children and adolescents still remain. This may mean that children still lack equal educational opportunities and conditions for the development of abilities in the field of digital technologies. In this chapter, we focus on assessing and uncovering various factors that may contribute to an explanation of the varying degrees of use of ICT by present-day (Czech) adolescents. We are interested in the adolescents' personality characteristics, family background, use of digital technologies in school, and use of ICT in communication. We focus primarily on the use of ICT in the home environment; unlike other studies, we also distinguish two basic purposes for which digital technologies are used by the adolescents. These concern free-time activities, such as playing computer or online games, online chatting, and surfing the Internet for fun, as well as school-related activities and school duties, such as using e-mail or social networks for communicating with classmates or teachers, using the Internet in the course of school preparation, and doing homework on a computer or mobile phone. In this chapter, we introduce a conceptual model containing relationships between the individual assessed fields and specific variables in those fields and the degree of ICT use by adolescents in an out-of-school environment.

In Chap. 6, *Parental Approaches to Digital Technologies*, we introduce the home environment and family with regard to the use of digital technologies. Young people spend a large part of their time with their families, and they encounter digital technologies in various situations and contexts here. In the family environment, different generations that grew up in different times and have different experiences with digital technologies meet. Some parents belong to a generation that grew up when access to digital technologies was not common at home or in school. But the present-day young people live in times in which digital technologies are a natural part of their world. The dynamics of the development and availability of digital technologies is reflected in the lives of individuals and in family life. In the past, television was the center of the household, and families spent time together watching it; with the arrival of mobile technologies, their use is "moved" more and more to the individual rooms, including the children's rooms. Admittedly, the parents affect not

only the children's approach to digital technologies, but also the manner in which they use them and the relationships the children form with digital technologies. Parents affect children both intentionally and unintentionally. Intentional affects include various kinds of regulations; unintentional affects occur when children watch their parents during their everyday use of digital technologies and may adopt some procedures or ways of using ICT. Parental regulatory strategies that address a certain direction of the use of digital technologies by children are an important topic of this chapter. We also pay attention to the manner in which the adolescents view the parental regulations. In this chapter, we look in more detail into the everyday lives of several Czech families with the goal of describing and explaining how digital technologies permeated their life, how the parents viewed digital technologies, and how the adolescents used the digital technologies in their free time and in their learning. We also focus on the ways that the rules are set in families for the use of digital technologies by the adolescents. These rules create frameworks for the use of ICT in various adolescent activities.

Chapter 7, *Young People and the Development of Digital Competence and Autonomy*, opens the final large section of our book. In this chapter, we focus on the manner in which the age at which the children start using digital technologies affects the development of digital literacy of Czech teens and what roles other factors connected to the use of digital technologies play in this development. Specifically, we focus on the connection between the age at which the children start using digital technologies and the Internet and the degree of their perceived competence and autonomy in the use of digital technologies at the age of fifteen. At the same time, we try to determine whether this relationship is affected by other variables, for example by the degree of use of digital technologies or by interest in digital technologies.

The third part of the book concludes with Chap. 8, *Digital Technologies and the Everyday Life and Learning of Present-Day Adolescents*, which maps and explains how digital technologies affect the adolescents' lives, how the adolescents accept or reject them, and how they use them. We try to capture the manner in which digital technologies are viewed by the adolescents themselves. We also try to map various forms of adolescent learning with the support of digital technologies. We present six insights into the lives of Czech adolescents with digital technologies, in which we focus on several fields of their use: in connection to the world, to school, to family, to peers, and to oneself. We build the presentation of life and learning on the metaphor of "ICT as a good servant but a bad master." With this metaphor, we want to convey that anything, including digital technologies, that is out of control is dangerous, even though while it only serves and is fully controlled by people, it can be necessary and advantageous. In this chapter, we aim for a detailed insight into adolescents' lives with digital technologies. On the basis of the acquired context, the manner of use of ICT, or the perceived degree of this use, we identify cases in which digital technologies play the role of a good servant in adolescent lives, fully and intentionally controlled by the adolescents, and when they can be considered a bad master, with the adolescents tending to be controlled by the digital technologies.

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Chapter 2
Education, Life, and Digital Technologies in the Czech Republic: The Story of a Post-Socialist Country in Central Europe

Abstracts In this chapter, we focus on the national context of our research, within which we briefly introduce the Czech Republic, its history and economy, changes in education after the fall of the Communist regime, and the current school system. Our primary focus is on the developments and the current changes of the education policy in the field of digital technology, but we also briefly mention some steps, specifically the fulfillment of political goals and the implementation of the suggested measures in education practice, that form the general framework of our research.

Keywords Czech Republic · History · Communist regime · Economy · School system · Education policy · Curricular documents · Digital technologies

2.1 Czech Republic: A Short Introduction to Its History, Economy, and Life

The Czech Republic, also known by the short-form name Czechia, is a country located in the central part of Europe. The Czech Republic was founded as an independent country when Czechoslovakia split in 1993 (see Table 2.1 for detailed characteristics).

2.1.1 History

In the fourth century BC, what are now the Czech lands were inhabited by the Celtic tribes of Boii, after which the territory was named Boiohaemum, or Bohemia in Latin. The territory of the main historical lands (Bohemia and Moravia) has not

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Table 2.1 Basic information on the Czech Republic

Land area:	78,871 sq. km
Population:	10.6 million (December 31, 2018); 5.3% immigrants and asylum seekers
Official language:	Czech
Political system:	Parliamentary republic
Capital:	Prague, population 1.3 million (December 31, 2018)
Administrative divisions:	14 regions
Religions:	Catholic: 10.4%; atheist: 34.5%; no religion stated: 44.7% (2011 census)
Currency:	Czech crown (CZK)
Neighboring countries:	Germany, Austria, Slovakia, Poland
Visegrád Group member:	Since 1991
OECD member:	Since 1995
NATO member:	Since 1999
European Union (EU) member:	Since 2004
Schengen area member:	Since 2007
GDP per capita (current $US):	23,069.4 (2018)

Czech Statistical Office (2014, 2020b, 2020c, 2021) and The World Bank (n.d.)

essentially changed since the Middle Ages; in the sixteenth century, the Lands of the Bohemian Crown became part of the Habsburg monarchy. The formation of an independent Czechoslovakia in 1918, in which two nations, Czechs and Slovaks, were united into a single state, is an important historical milestone. The resulting democratic state guaranteed personal freedom and dignity to its citizens. World War II interrupted the development of the young country: for six years, the Czech lands were part of the Nazi Third Reich as the Protectorate of Bohemia and Moravia, and Slovakia became an independent state. After World War II, Czechoslovakia was reinstated. In 1948, all power in Czechoslovakia was assumed by the Communist Party, which rather quickly built a totalitarian state that was a part of the Soviet bloc (McDermott, 2015; Zounek et al., 2017).

In the 1960s, there was an attempt to reform the socialist regime. The reformation movement culminated in the 1968 Prague Spring, which was terminated by an invasion of the Warsaw Pact armies (Zounek et al., 2017). This invasion started a period of "normalization" (return to normal); in other words, a return to the state before the reformation movement. The changes brought a return to totalitarian practices, including the inability to travel to Western countries, to conduct business, and to freely express opinions.

The fall of the Communist regime in 1989 meant the reconstruction of a democratic state (Fawn, 2000; see also Saxonberg, 2001; Berend, 2009; Vaněk & Mücke, 2016). In 1993, Czechoslovakia peacefully separated into two independent countries: the Czech Republic and Slovakia. The two countries still maintain very close economic and cultural ties, due in part to the fact that the Czech and Slovak

languages are mutually understandable as they are both in the West Slavic group of languages. The history of the Czech lands has always been influenced by both the Slavic and the German culture; Czech cultural traditions are a combination of both influences.

2.1.2 Economy

After the fall of the Communist regime, the Czechoslovak economy experienced a widespread restructuring and privatization of the economy, which had been exclusively owned by the state before 1989. These processes were connected to the liberalization of business and commerce, the privatization of state enterprises, and the deregulation of prices and of the job market. The country also opened to international markets and foreign investments. Other former Soviet bloc countries, including Poland and Hungary, underwent similar changes.

After the fall of the Communist regime, the Czech Republic experienced several periods in which economically successful years alternated with less successful ones. In the mid-1990s, the Czech Republic was considered one of the most successful economies of post-communist Europe. The country had handled the radical structural economic changes rather well and the economy grew quickly.

However, a crisis in the mid-1990s threw the country into a recession. The period of crisis was caused by internal rather than external problems, including the failure to fully implement some reforms. Other weak points of the developments after 1989 include the late formation of an insufficient and barely functional legal framework; some reforms that were not carried out, such as pension reform; and the insufficient funding of schools, science, and research. This resulted in the situation in which after 30 years of economic restoration, Czech gross incomes are still only at 30–50% of German and Austrian gross incomes (Semerák & Švejnar, 2019). This was also a reason that the Czech Republic was selected by foreign investors and companies: for its cheap and skilled workforce, including its car manufacturers.

The Czech Republic was not very negatively affected by the worldwide financial crisis of 2009. This was due in part to the Czech Republic's refusal to accept the euro as its national currency, which partially "protected" the Czech Republic from many consequences of this global crisis. The Czech Republic also has one of the lowest long-term unemployment rates in Europe. For example, in 2018, the overall unemployment rate in the Czech Republic was 2.2%, a record low value; the EU average for the same year was 6.8% (Czech Statistical Office, 2020b, c, 2021).

In terms of gross domestic product (GDP) per capita in purchasing power standards (PPS), in 2018, the Czech Republic achieved 91% of the EU average: the same as Spain, but more than Slovakia (74%), Poland, or Hungary (each 71%). For comparison, Germany achieved 123% of the EU average and Finland achieved 112% in the same year. According to EU data (European Union, 2020), in 2018, industry was the most important sector of the economy (30%), followed by

wholesale and retail trade, transportation, and hotels and restaurants (19%), and public administration, defense, education, healthcare and social work (16%).

The IT field is also an important part of the Czech economy. For example, Avast, a well-known cybersecurity software manufacturer, is originally Czech, and is the current owner of AVG, another originally Czech manufacturer of antivirus programs. Several popular computer games were created in the Czech Republic, including Operation Flashpoint, Ylands (Bohemia Interactive a.s.), the Mafia series (2K Czech), and Kingdom Come: Deliverance (Warhorse Studios). Many successful digital start-up projects and companies operate in the Czech Republic, such as Prusa Research (3D printing and printers) and Kiwi.com (an online travel tech company).

Since 2014, the European Commission has been tracking the progress of individual countries in the field of digitalization development by monitoring the Digital Economy and Society Index (DESI), which covers the following indicators: connectivity, human capital, use of Internet services, integration of digital technology, and digital public services (European Commission, 2020a, b). In the 2020 report, the Czech Republic placed seventeenth out of twenty-eight member states[1] with a score of 50.8, which is slightly below the EU average of 52.6. The Czech Republic has improved slightly since 2018, when it was nineteenth in the EU (European Commission, 2020a, b).

The Czech export market is focused especially on EU countries, with Germany taking 32% of total exports, Slovakia 8%, and Poland 6%. Outside of the EU, the largest portion of exports goes to the United States and Russia, each taking 2% of the total export. Germany is the largest exporter for the Czech Republic, at 29% of total imports, followed by Poland with 9% and Slovakia with 6%. Outside of the EU, 8% is attributed to imports from China and 2% to imports from the United States.

2.1.3 Daily Life and Households

The Czech Republic has undergone several important demographic changes. As a result of population aging, the representation of senior citizens has increased and the ratio of people of productive age has decreased. Natality has decreased; at the beginning of the twenty-first century, the overall fertility was one of the lowest in the world (Czech Statistical Office, 2020b, c, 2021).

The job market has also changed. The emphasis on time intensity has increased; this is connected to long-term daily absence from the home. The overall stress rate has increased as well. Job insecurity has become a new issue that did not exist in its present form before 1989 (Dudová, 2007). Before the fall of the Communist Party in 1989, work was mandatory for each inhabitant, which means that job insecurity, particularly in terms of letting people go, was not an option. For many people, this

[1] The United Kingdom is still included in the 2020 DESI (figures refer to 2019).

represented an entirely new situation that they had to deal with after the regime change.

As in other European countries, there have been changes in personal and family lives (Coyette et al., 2015). The most prominent changes include the declining importance of the institution of marriage and an increase in unmarried cohabitation, increasing divorce (almost one out of two marriages ends in divorce in the Czech Republic), and a consequent increase in the number of single parent and separated families. In 1993, the ratio of children born outside of marriage was less than 13%; in 2018, it was 49% (Czech Statistical Office, 2020b, 2021). The postponement of parenthood and an increasing portion of people living alone are also related to these changes (Lacinová et al., 2016).

The Czech Republic can be measured using the Human Development Index (HDI), which can be described briefly as a marker of the standard of living. It is a tool used by the UN to compare key dimensions of human development in individual countries, including: a long and healthy life, being knowledgeable, and having a decent standard of living. In 2019, the HDI[2] measured the Czech Republic at 0.891, assigning it to twenty-sixth place out of over 190 countries. Spain was in 25th place with 0.893, and France had an identical index (0.891). The index of Poland was 0.872, putting it in 32nd place, and Slovakia was in 36th place with 0.857.

2.1.4 Digital Technologies in Households

Almost all Czech households own a (mobile) phone, and nearly 78% of households own a computer. For several years, there has been a large difference in the possession of digital technologies between households with and without children. In 2015, almost 94% of households with children had a computer; 65% of households without children had one. A more detailed look at the devices that are available in Czech households in the long-term perspective reveals an increasing ratio of mobile devices, especially laptops (Czech Statistical Office, 2020a, c). At the same time, in the Czech Republic, as in Cyprus and Slovakia, mobile network operators offer the most expensive mobile broadband products (European Commission, 2020a, b).

In 2009, the Internet was used by 90% of inhabitants between the ages of 16–24; in 2019, the rate was almost 100% (Czech Statistical Office, 2020a, c). However, in terms of access to the Internet, Czech households are below the EU average.

[2] For more information, see http://hdr.undp.org/en/countries/profiles/CZE and http://hdr.undp.org/en/content/human-development-index-hdi

2.2 From a Totalitarian to a Democratic School System

School systems in individual countries are the result of specific developments. The changes occurring after 1989 were decisive for the current Czech education system (von Kopp, 1992; Mitter, 2003).

In Czechoslovakia before 1989, the school management and administration system was highly centralized. The competences of the government toward the school system were divided among several ministries, and the Communist Party leadership enforced the education policy, the educational content, and the course of the pedagogical process in a centralized manner, either directly or through the ministries. After 1989, a widespread democratization and decentralization of the school administration system occurred, which led to the following changes:

- The state school system monopoly was cancelled and the establishment of private schools, including religious schools, was enabled.
- Unified and binding education programs for primary and secondary schools were cancelled and the education system was gradually significantly diversified.
- The goals and the content of education were rid of all ideological components and the right to freely voice one's opinion started to be respected.
- New textbooks were created, with a new system of competition among textbook publishers.
- Centrally determined numbers of students accepted to individual schools were cancelled and the offer of schools was adapted to the demands of the applicants, especially in secondary schools.
- School management was altered, during which the administrative, economic, and pedagogical autonomy of schools was improved, as was the role of school principals.
- Foreign relations shifted; in connection with joining the EU, the Czech Republic started increased participation in related school activities and initiatives.

The post-revolution period also brought some negative phenomena, such as the termination of the institutional system of further educating pedagogical workers, which had functioned rather well (Walterová, 2004).

Discussions about significant changes in the school system went on for almost 15 years after the Velvet Revolution. Until 2004, the primary and secondary school system was governed by a "socialist" Education Act from 1984, which was merely amended many times in the post-revolution period.

The discussions about the form of the Czech school system culminated in the acceptance of a new Education Act (Act No. 561/2004 Coll), which was prepared as a complex legal standard with a number of new features, including:

- A new two-stage curriculum was established (framework and school education programs).
- The rights and obligations of the participants in education were extended, both inside and outside of schools and educational facilities; the extent of the rights

and obligations of children, pupils, students, and their legal representatives was also newly explicitly described.
- The autonomy of schools and educational facilities was extended; for example, school boards were introduced as a mandatory school body and the evaluation of schools was introduced.
- The Education Act emphasized a lifetime approach to learning.

In addition to that key legal regulation, the Act on Pedagogical Workers (No. 563/2004 Coll.),[3] which can be considered another important Act significantly shaping the form of education in the Czech Republic, was adopted. This Act newly modified the conditions during the establishment of employment contracts of pedagogical workers, defined the prerequisites for the performance of work of pedagogical workers, and included further education and a career system for pedagogical workers (prepared in accordance with Ministry of Education, 2009b).

The Czech school system currently consists of several types of schools that are hierarchically connected. The Czech school system form is anchored primarily in the school system Act (Act 561/2004 Coll.). The schools are managed as a part of public administration and the powers are divided among central governing bodies, regions, and municipalities (Eurydice, n.d.). Figure 2.1 shows the structure of the Czech education system.

The Ministry of Education, Youth and Sports, as a state administration body in the school system, is responsible for the condition, conception, and development of the education system, allocates financial resources from the state budget, sets out the qualification requirements and working conditions of teachers, and determines the general content of education from pre-primary to secondary level. The regions (local government) then establish upper secondary schools (ISCED 3). Nursery

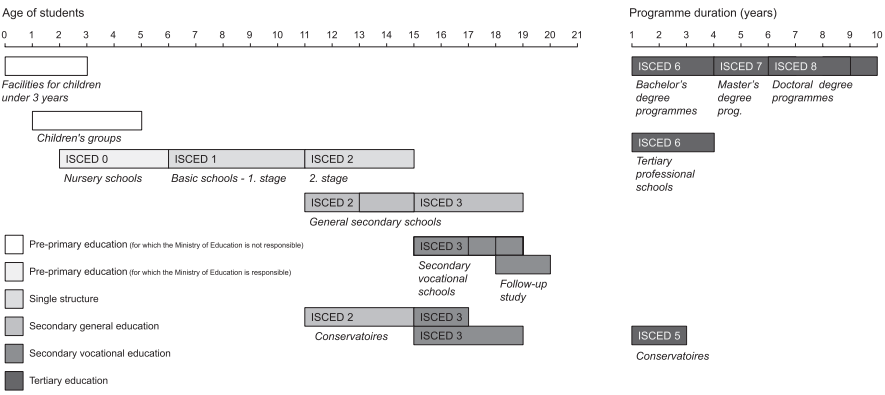

Fig. 2.1 School system in the Czech Republic. (Adapted from Eurydice n.d.)

[3] According to the aforementioned Act (Section 2), a pedagogical worker is a person who carries out direct teaching, direct educational (...) activity by direct action on the learner, …; is an employee of a legal entity that carries out the activities of a school, or an employee of the state, or the director of a school.

schools (ISCED 0) and primary schools (ISCED 1, ISCED 2) are established by municipalities, which also provide compulsory education. This begins at the age of six and takes nine years. Primary schools can also be established by private subjects and churches, as well as by regional governmental bodies or the Ministry of Education. Primary and lower secondary education (basic education) usually takes place in primary schools of nine grades, which are divided into two stages (unified structure). Six-year or eight-year primary schools can also provide lower secondary school education. After completion of the compulsory education, most students continue to upper secondary education (ISCED 3). The high selectivity of the Czech education system has been discussed since the 1990s (Matějů et al., 2006). The high dependence of student results in school education on their parents' education and the rather large differences between the student results from different types of schools have been observed repeatedly, for example by the PISA assessment.

Similarly to other OECD countries, public funding is the main funding source of primary to tertiary education. In the Czech Republic, the funds expended on the operation of educational institutions are lower than the OECD average. The total (public and private) expenditure on primary to tertiary education as a percentage of GDP was 3.5% in 2016, well below the OECD average of 5.0%, and the salaries of Czech teachers are among the lowest in the OECD countries (OECD, 2019).

In the Czech Republic, the content of the education is outlined by two levels of curricular documents: framework educational programs (FEPs) that represent the national level, and school educational programs (SEPs) that are created by every school on the basis of the "boundaries" stated in the FEP. The educational content in the FEP is defined by educational areas that are developed in two categories: the definition of the curriculum and the expected outcomes of students. Information and communication technologies are one of the nine areas in both the first and the second stages of primary education and they allow all students to achieve a basic level of information literacy.[4] The document further states: "The skills acquired in the educational area of Information and Communication Technologies allow pupils to apply computer technology using a wide range of educational software and information sources in all areas of their basic education. This application level goes beyond the content of the educational area of Information and Communication Technologies and becomes part of all educational areas of basic education" (Ministry of Education, 2007, p. 32, 2017, p. 38[5]). In Czech schools (ISCED 1–3), digital technologies are taught as an independent compulsory subject, but digital technologies should also be a part of all other compulsory subjects within the curriculum of the given stage of the school and they are also understood as a cross-curricular

[4] In this context, information literacy means elementary skills in the use of computer technology and modern information technologies, orientation in the world of information, creative work with information, and the use of information in later education and in practice in life (Ministry of Education, 2017).

[5] The only FEP for basic education available in English is from 2007. We quote directly from that text (*.PDF version) here; the 2017 version of the document was not translated, but the text in Czech was identical to the 2007 version.

theme Eurydice (2019). The newest education policy strategy of the Czech Republic (Ministry of Education, 2020), which we will discuss later, makes allowances for revisions of the FEP and therefore also the revision of teaching digital technologies.

The FEP for basic education lists a total of six key competences: competence to learn, competence to resolve problems, communicative competence, social and personal competence, civic competence, and work competence. Digital competence is not explicitly included in the key competences, but it forms a part of some other key competences. For example, the communicative competence includes the use of information and communication means and technologies for good and effective communication with the surrounding world (Ministry of Education, 2017). Another example is the cross-section topic of environmental education, in which the active use of digital technologies is expected in the course of searching for current information on the condition of the environment, determining the seriousness of ecological problems, and recognizing their interconnectedness (Ministry of Education, 2017).

2.3 The Path of Digital Technologies into the School System

The permeation of various technologies and technical means into education in the Czech Republic is not a matter of mere decades; with only slight exaggeration, the entire twentieth century can be denoted as the "century of technologies" in education. In the 1920s, educational programs for schools were prepared for radio broadcasts; it can be said that the radio broadcast was connected to the initial use of audio technologies in education. Even before World War II, gramophone records were used in education for learning languages (Zounek & Šeďová, 2009).

2.3.1 Technology and Education Behind the Iron Curtain (Before 1989)

In Czechoslovakia, the educational use of television started in the early 1960s. Great expectations were connected to the use of television in education. It was even considered that in certain phases of education, televisions could completely replace teachers. The television was also considered as an aid for a more graphic lecture by the teacher, as a complement of the teaching lesson (Lauda, 1962), and it was used in the course of preparing teachers (Mareš, 1976).

Czechoslovakia was greatly affected by the wave of programmed learning and teaching machines. From a modern viewpoint, these devices were very simple, but the legacy of programmed learning formed one of the basic building blocks of the later pedagogical use of computer technologies (Kulič, 1986). Pedagogical research focused on programmed learning and its experimental analysis developed in

parallel, and the different degrees of tiredness in programmed teaching and classic teaching were compared (Kulič, 1963; Šímová et al., 1969). Television and its use as a teaching tool were the subject of many studies (Jošt, 1986) as was the pedagogical efficiency of teaching videoprograms (Macek, 1987).

The first theoretical concepts capturing the beginnings of the expansion of modern technologies in the widest possible sense appeared in the 1960s. The Czech environment saw the birth of a multi-field study analyzing the state of society with significant overlaps with the future, published as *Civilization at a Crossroads* (Richta, 1969). The book operated with the contemporary term of a scientific-technical revolution, which was understood as a "universal and permanent transformation of the structure and dynamics of manufacturing forces of human life" (Richta, 1969, p. 170). The publication showed both positive and negative sides to the development of technology in modern society rather graphically. For example, the authors of the study presumed that new technologies would soon be able to provide people with completely new options of communication using new transfer principles and information storage. On the other hand, they warned that the technologization of society would lead to human solitude and to a lack of social contact. The book tried to systematically compare developments in capitalist and socialist countries and to use the available statistical markers. The book was written in the late 1960s in the relatively free period before the invasion of the Warsaw Pact armies. The neo-marxist opinions of its main author, Radovan Richta, were discussed by Daniel Bell in his book, *The Coming of Post-Industrial Society: A Venture in Social Forecasting* (1973).

It is generally known that the countries of the "Eastern bloc" were rather behind in terms of computer development in comparison to more developed countries. In the early 1960s, the lag in computer development was estimated at approximately ten years (Zelený & Mannová, 2006). The situation was made more difficult by the impossibility to import high-quality contemporary computers from Western countries and by the similarly impossible contact with international institutions and sites at which first-rate research and development took place (especially after the invasion of the Warsaw Pact armies). Despite all the handicaps, Czechoslovakia was the figurative peak among the "Soviet bloc" countries (Naumann, 2009).

Czechoslovakia manufactured the school microcomputers IQ 151 G, Didaktik Alfa, and PMD 85 (for more information, see Rambousek, 1989). These computers did not achieve the parameters of computers manufactured to the west of the Czechoslovakian borders and their usability in education was rather limited. The absence of good teaching software, as well as basic program equipment, was one reason for this condition. Even text editors and table processors were often unavailable. Graphics editors were not part of the standard program equipment in the contemporary computers. Nevertheless, at that time, these computers represented a technological advancement under the given conditions. The technologies and computers were attributed rather significant importance in education, which is confirmed by the fact that research in the field of technologies became a part of the state plan for research work between 1976 and 1980, covering principal questions such as whether a "division of labor" between humans and machine was possible,

whether the living work of teachers could be replaced, and what elements of the teachers' work could be replaced with a machine and how (Tollingerová, 1977). In the 1980s, studies were focused on the creation and use of various didactic tools in primary and secondary schools (Kouba, 1985, 1986).

Inclusion of technologies into education in Czechoslovakia in the 1980s was reflected in the document *A complex long-term electronization program in upbringing and education in the school system*, which was approved by the socialist government in 1985. Its implementation was divided into several steps. The first step was to equip schools with computational technology and electronic aids, according to the contemporary terminology. The next goal was to implement the questions of electronics and computer technology into teaching plans and curricula. The plan was to train a large number of teachers and to create programs for education and for the use of computers in the individual subjects. The entire program was also supposed to be accompanied by pedagogical research (Caha, 1986). Disregarding the fact that the plan was created in the strongly ideological environment of the Communist regime, it is interesting that in principle, it contains topics and goals similar to those of documents created approximately fifteen years later in a different social context.

The previous section returns to times that might seem to be a technological Stone Age to many people today. Nevertheless, before addressing the developments after 1989, we would like to point out one interesting fact. In pre-1989 Czechoslovakia, the activity in the field of "computational" technology implementation into education was accompanied by a rather lively expert debate that went quiet after the revolution. It is clear that all activities before 1989 were strongly affected by the policies of the time and especially by communist ideology. It is also clear that the technologies of that time had very limited options in comparison to the digital technologies of the twenty-first century. In addition, they were often not available to schools. Despite all these differences and negatives, some research findings and thoughts from the period before 1989 from the field of pedagogy and psychology remain remarkably current, such as the problems of technologies and controlled learning.

2.3.2 Post-revolution Waiting (1990s)

The interruption of the expert discussion and of national implementation steps in the field of digital technologies can probably be considered negative consequences of the Velvet Revolution in Czechoslovakia. In the effort to "purge" the school system of totalitarian practices and to create a modern democratic school system, little attention was paid to the valuable and usable results of the existing research and development. The fact that the opening of the borders and the fast development of digital technologies and their expansion into all fields of life were understood as a completely new stage that had almost nothing in common with the previous developments is another explanation for this discontinuity.

Apart from opening the market with computers and other digital technologies, the second key milestone was the connection of Czechoslovakia to the Internet in 1992 and the subsequent commercial expansion of the Internet from 1995. The first search browsers start to appear at this time, and the options to connect to the Internet from home or elsewhere appeared gradually. During the 1990s, the price of computers and other digital technologies decreased, so ICTs became much more accessible to ordinary users. They were still very far from being a part of everyday life, as the prices of more powerful desktop computers were as much as ten times the average monthly salary of that time.

Understandably, digital technologies started to permeate the field of education as well. In the 1990s, the equipping of schools with ICT was de facto the decision of the individual primary or secondary schools and of their management, including the funding. At that time, there was no national program or project that coordinated or otherwise helped the schools in their activities. Nevertheless, there were schools that started to implement digital technologies into education or into various other activities within the school, such as its management. One interviewee perceived the 1990s as a period in which the number of restrictions and limitations decreased and the number of choices and responsibilities increased. Older teachers had to learn the basics of working with computers and other digital technologies (Zounek et al., 2018a). Some Czech schools participated in the Second International Information Technology in Education Study Module 2 (SITES M2) international qualitative research, conducted from 2000 to 2003 (Kozma & Voogt, 2003).[6] Case studies of Czech schools focused on school intranets, on school libraries as multimedia centers, and on computer literary courses for students.[7]

After 1989, no journal focusing specifically on the topic of digital technologies in education, similar to *The British Journal of Educational Technology*, was being published in the Czech Republic. The topic of digital technologies had not found its way even into the general Czech scientific pedagogical journals. We performed a content analysis focused on 1998–2002 (Zounek, 2006) that showed that not even the two most important Czech pedagogical journals or the top Slovak pedagogical journal paid much attention to the issues of information and communications technologies on its pages. This topic concerned only a very small percentage of articles from the total number of published texts. The articles were generally focused on the Internet (the option of using the Internet in the school system, comparing the Internet to exercise books, etc.), teaching (for example, using ICT as a didactic measure in education), and teachers (information education and practical preparation of teachers on the use of digital technologies). The topic of digital technologies in preparing future teachers was the subject of a single contribution, and the topic of ICT-supported teaching of students did not appear at all.

[6] Basic information is available here: https://sitesdatabase.cite.hku.hk/sites_submenu/about_what.htm (cited on 24 May 2020).

[7] The description of case studies is available in Czech and English at: http://it.pedf.cuni.cz/sitesm2/ (cited on 24 May 2020).

Czech pedagogical journals for the wider (pedagogical) public – *Moderní vyučování* [Modern Education] and *Učitelské listy* [Teacher Pages] – reflected the topic of digital technologies in education similarly rarely. Between 1998 and 2002, the researched journals dedicated a rather low degree of attention to ICT, with articles focused on digital technologies constituting less than 3% of all published articles, especially considering that both journals declared a positive relationship to innovations in school and education more or less explicitly. This is rather interesting, especially with regard to the fact that at the end of 1990s, the topic of digital technologies in education started to become a subject of lively discussion in the school system and in society as well.

Some media definitely communicated the message to their readers that this topic was not important enough to deserve more attention. Of course, their readers potentially included teachers or educators of teachers, as well as parents, who could thus form a very narrow view of digital technologies in education and of the wider contexts of this topic.

2.3.3 New Era, New Challenges (2000–2014)

A new era dawned in the field of digital technologies at the beginning of the twenty-first century. After 2000, the first and key strategic documents were approved that concerned digital technologies in education, determining the national priorities and the implementation steps leading to the fulfillment of these priorities.[8] Table 2.2 shows that the inclusion of ICT in education was the subject of a whole range of documents created by the government (at the governmental level) and by the Ministry of Education.

The National Program for the Development of Education in the Czech Republic: White Paper is one of fundamental strategic documents of the modern democratic Czech education policy (Kotásek, 2001). The document was based on analyses and evaluations of the Czech school system between 1995 and 2000 by both Czech and international experts (OECD). A public discussion announced by the Ministry of Education in which the problems of the education system development were discussed by social partners, representatives of the civic society, and various interest groups, became the second source for determining the intentions and recommendations included in the document. The preparation of the document itself thus represented a rather new element, because the vision of the development was based not only on political decisions or expert documents, but also on the opinions of almost all parties participating in education. Such an approach had been completely unthinkable in the socialist totalitarian Czechoslovakia and it was not used even in the 1990s.

[8] The Czech Republic was among the last countries in Europe to approve such documents (Eurydice, 2001).

Table 2.2 Important documents and strategies in the implementation of ICT into education in the Czech Republic

Year	Document (strategy) name	Basic description/focus (goals)
1999	State Information Policy[a] (government document)	Building and developing an information society, creating prerequisites especially for improving the quality of life of individual citizens, improving efficiency of the state administration and self-administration and improving the quality of support of business development. In the field of education, creating prerequisites for mastering work with information using ICTs on schools of all types and creating a moral codex for working with information.
2000	The Concept of State Information Policy in Education (document from the Ministry of Education)	Ensuring the availability of digital technologies (infrastructure) to all people participating in education (in schools, other education, or lifelong learning). Supporting the integration of digital technologies into education at all stages, with an emphasis on the key goal of prepared teachers.
2001	National Program for the Development of Education in the Czech Republic: White Paper (document by the Ministry of Education)	Developing student competences at all school levels, effectively using information and communication technologies in education and in work and personal life. Supporting schools in forming conditions to use ICT in modernizing the methods and forms of education, including supporting the development of teacher competences in this field.
2004	State Information and Communication Policy (government document)	Equipping institutions with an infrastructure (to complete the connection of all educational institutions to the Internet and increase connection speed), systematically increasing the information literacy of educational institution workers, and increasing the ability of schools to use ICT and educational software (e-learning).
2008	Developmental Strategy on ICT in Education for 2009–2013 (document from the Ministry of Education)	Allowing a standard use of digital technologies in teaching of most subjects as well as the use of ICT as a standard information and communication tool for teachers and students. Supporting the equipping of schools with digital technologies, supporting teachers and administrators in their education in the use of ICT, and supporting electronic communication between the school and parents.
2013	Digital Czech Republic v. 2.0: The Way to the Digital Economy (government document)	Update of the previous state information policy. Education represented one of the priorities. Increasing digital literacy of the inhabitants and developing lifelong learning.
2014	Digital Education Strategy 2020 (document from the Ministry of Education)	Three priority goals: opening the education to new methods and ways of teaching using digital technologies, improving student competences in the field of work with information and digital technologies, developing the computational thinking of students.
2015	Digital Literacy Strategy of the Czech Republic for 2015–2020	Increasing the level of digital literacy of citizens of the Czech Republic in order to support a competitive economy, adaptable human resources, and the individual quality of life. Four main priorities: employment rate, competitiveness, social integration, support of family.

(continued)

Table 2.2 (continued)

Year	Document (strategy) name	Basic description/focus (goals)
2020	Strategy 2030+ (document from the Ministry of Education)	Providing support for the development of student digital literacy (and computational thinking) as part of teaching of all subjects. Supporting the digital competences of pedagogues. Decreasing the inequality of students in terms of access to digital technologies and preventing a digital chasm.[b]

[a]This document was not primarily focused on the field of the school system and education; it expressed the priorities of the Czech Republic in the field of ICT at the given time
[b]Strategy 2030+ was being prepared at the time of writing. The background materials are available only in Czech

Almost at the same time (in 2000), the Czech government approved the Concept of State Information Policy in Education (further referred to as the Concept), which is one of the most fundamental and important documents of the Czech education policy, because it declares the importance of digital technologies in education. The preparation of this document was not preceded by a more extensive discussion and the document itself does not mention any background studies or authors as the white paper does.

The Concept works with the term *information literacy*, which it perceives as "an ability to use information sources and information and communication technologies in order to increase work and life efficiency ... the knowledge of ICTs and the ability to use them on a level comparable to other knowledge components of literacy perceived in a complex way, such as reading, writing, and calculating (Government of the Czech Republic, n.d.). This document uses the term *literacy*, or more specifically *information literacy* (not digital literacy), and perceives it to be as important as other basic literacies. This is interesting especially because in discussions, documents, and education policy, the terms *competence* and *ICT competence* were later preferred. The term *competence* is perceived as an individual's ability to use digital technologies as tools and at the same time to understand the digital technologies as a phenomenon affecting and constantly changing the world around us (Altmanová et al., 2011).

The terms *literacy* and *digital literacy* were rarely used in this context until recently, when the Digital Education Strategy 2020 from 2014 was approved (see below for more information). The Concept from 2000 also worked with the Czech Republic's planned joining of the EU, stating that within the future free movement of workers within EU borders, the knowledge of ICT use on the same level as other EU countries would be indispensable for mutual recognition of qualifications for the performance of works.

The actual implementation of the Concept started in 2001; it was divided into several phases. The first phase dealt with a rather wide range of tasks connected to the introduction of ICT into schools; the second phase focused on the education of the wider public in the field of ICT use.

Since 2001, the Concept implementation process has been accompanied by much confusion, uncertainty, mistakes, and delays. For example, the schedule of

partial goals was rewritten, including the postponement of the term of implementation by up to one year. Initially, the project was mostly focused on equipping schools with digital technologies, and the pedagogical goals themselves were secondary. The dominance of the technological focus was also emphasized by the fact that teacher training was initiated a full two years after the beginning of the implementation and specialized trainings focused on advanced users (including the didactic use of ICT in individual subjects) were initiated more than one year later. One weakness of the Concept was the lack of consideration for specific training of school administrations in the field of digital technologies. Therefore, the school principals, who had the decisive influence on the implementation of digital technologies in their schools both in the fields of planning and concepts and in the field of implementation, were even not supposed to be trained. People who were supposed to support teachers and create the environment in which ICT could be implemented in schools were not sufficiently prepared. At that time, similar weaknesses in national strategies could be found in other European countries as well (Eurydice, 2001).

Furthermore, the Concept did not consider the preparation of future teachers on the use of digital technologies in their teaching despite the fact that the digital technologies were starting to become a part of most school equipment at that time. The absence of a systematic pedagogic evaluation of the project or of pedagogical research beyond its mention in the document can be considered another weakness of the entire implementation phase of the Concept.

Despite these problems, the schools were able to purchase training programs and other electronic teaching materials and train their teachers in the (basic) use of digital technologies.

In 2006 and 2007, there was a surprising reversal of the implementation of digital technologies into education in the Czech Republic and the implementation of the Concept was de facto stopped without a clear reason. The responsible department at the Ministry of Education was disbanded and the funding for planned activities was removed from the budget draft for 2007–2010. Central support of the inclusion of ICT into education in its original form was terminated. In some programs, such as the equipment with infrastructure, this development was expected, because their goals had been generally achieved earlier; however, many specific projects in schools were stopped directly in the course of their implementation.

In a short period of time (in 2008), activities leading to the preparation of a new concept of governmental policy in the field of the inclusion of ICT into education were initiated. By September 2008, a document by the Ministry of Education titled *Proposal of the concept of the development of information and communication technologies in education 2009–2013*[9] was written.

However, in 2009, at the beginning of the economic crisis, it was discovered that the concept of the development of ICT could not be implemented to the extent planned, especially with regard to the condition of public finances in the Czech Republic.

[9] The same as *Developmental Strategy on ICT in Education 2009–2013*.

Despite all the difficulties, between 2007 and 2014, the integration of digital technologies into education was supported (in the amount of more than 5 billion CZK) from the European Social Fund and including a contribution from the state budget (Ministry of Education, n.d.). The support focused on all priority fields. For example, it concerned the compilation of electronic materials available online, the transformation of teaching methods, and provision of educational software. At this time, many digital educational materials and good practice examples were created; for example, schools purchased interactive digital boards, tablets, various measuring devices, etc. During this time, a methodical portal (rvp.cz) was established; it is still operated and continues its development.[10] Pedagogues increased their competences, especially in the ICT field. Nevertheless, the expected transformation of traditional education in the direction of education focused on skills and competences did not take place. Similarly, the planned regional school centers were not established. These were supposed to become the local methodical (support) centers of the surrounding schools and they were supposed to support the sharing of good practice examples in the field of use of digital technologies. The efforts to use digital technologies for the purpose of informing all the participants in school education (parents, school management) on the problems of digital technologies in education and to improve communication between these participants were left almost completely without any support from the state (Ministry of Education, n.d.).

It cannot be said that the portal focuses only on a single matter, such as the teaching of students or the use of digital technologies in connection to students' results or changes in the lives and learning of students in connection with equipping schools and households.

2.3.4 Strategy vs. Reality (2014–Present)

After the awkward implementation of the previous phase, in 2014, the *Digital Education Strategy 2020* (further referred to as Strategy or DES) laying out the priorities of the *Education Policy Strategy of the Czech Republic 2020* was adopted.[11] In the DES, digital education is the key concept; it is perceived as "education reacting to the changes in society related to the development of digital technologies and their use in various fields of human activities" (Ministry of Education, n.d., p. 3). It includes both the education that effectively uses digital technologies to support education and learning and the education that develops the digital literacy of

[10] The rvp.cz methodical portal was established as the main methodical support of teachers and for the purpose of FEP support (curricular reforms) in schools. The portal represents an environment in which teachers can inspire each other and share their experiences. The portal uses a number of online tools, including blogs, video, e-portfolios, wikis, and webinars. Other materials shared/available here include teaching materials created by teachers, articles, and current curricular documents.

[11] Available at: https://www.msmt.cz/vzdelavani/skolstvi-v-cr/strategie-digitalniho-vzdelavani-do-roku-2020

students and prepares them for the requirements of society and the job market, requirements in skills and abilities in information technology that keep increasing (Ministry of Education, n.d.).

The DES declares that the given goals cannot be achieved without providing support to the teachers who are to introduce the planned changes into the everyday school life and into teaching. The document includes activities that should lead toward a better-informed public and an understanding of why digital technologies are being included in education. On one hand, the effort to equip schools with digital technologies was clearly suspended; on the other hand, the DES certainly tried to include the neglected features of the digital technology implementation.

The DES and the individual measures are based on available data from the Czech Statistical Office, the Czech School Inspectorate, Eurostat, the Eurydice network, etc.; during the compilation of the document, some data from Czech and international (pedagogical) studies were used as well.

At the time of writing of this book, it was too soon for a full-scale evaluation of the implementation of the DES, but some partial evaluation reports written by various institutions were already available. However, no systematic evaluation of the implementation stages and no pedagogical research are being conducted. The implementation process is monitored by the Czech School Inspectorate, but it only provides insights into the problems, and it does not offer any representative studies.

The evaluation of the implementation of the priority goals of the DES by the Ministry of Education (Ministry of Education, 2019) stated that all measures except two are in some phase of implementation. The acceptance of the Digital Competence Framework for Educators (DigCompEdu) (European Commission, n.d.) as a standard for the digital competences of teachers in the Czech Republic can be considered a fulfilled goal.[12] However, the report is not very clear on how the framework will be implemented in the real world.

Limited progress was recorded in the offer of available further education for pedagogical workers; a system of online courses, including the evaluation of the course quality by participants themselves, should have been created. According to the interim evaluation by the Ministry, progress was reported in the informed status of the public and in the popularization of programming lessons (in this case, the activities were connected to the Code Week campaign[13]).

The interim evaluation by the Ministry of Education seemed rather positive, even though some statements concerning the fulfilled activities marked as "significant progress" very non-specific and unclear statements that do not provide a clear account of the real performance of the given activity.

[12] For more information, see: https://ec.europa.eu/jrc/en/digcompedu/supporting-materials

[13] Website: https://codeweek.eu/

The fulfillment of the DES is independently monitored by the Union of Computer Specialists[14] (hereinafter referred to as UCS), which tends to evaluate the progress of implementation on the basis of real measures or impacts. The evaluation of the UCS does not refer to any methodology or sources on the bases of which its evaluation was made. Therefore, this is more of an opinion of a professional organization based on monitoring the reality of Czech schools. The UCS participates (through its members) in a number of projects in schools; UCS members serve on various commissions and attend meetings on various levels of the school system with the goal of supporting implementation into schools. Some members are teachers at primary or secondary schools and some teach at universities.

The latest UCS evaluation report (Lessner, 2019) stated that actual results of the fulfillment of individual measures of the DES are visible for the first time. The DES was introduced in 2015 and the report from 2019 stated that the results of fulfillment of the DES were visible for the first time. As an example of results, the evaluation report mentioned prepared changes in curriculum in the field of informatics and digital literacy from preschool education through secondary schools. The report mentioned an interesting paradox; Lessner (2019) wrote: "A school inspection has stated and proven with data that school equipment does not correspond with the current needs." The implementation of the research showing the actual conditions in schools was a positive result, as it represented the fulfillment of one of the measures included in the DES: the evaluation of the results of the implementation of the DES. However, the research result, suggesting insufficient equipment in schools, was negative. This indicates a failure to fulfill some of the measures approved within the DES as well as within the plans and visions before 2014.

Furthermore, the report suggested that the fulfillment-related problems concern key areas, such as curriculum innovation, digital teaching materials, teacher education, and stable and more long-term financial support of the reforms. A traditional problem appears: the professional development of school management in the field of implementation of digital technologies into school life. The report summarized the condition of DES implementation very critically. "Once again, we can repeat that DES is not a priority, or that it is only a declarative priority" (Lessner, 2019, para).

The report of the Supreme Audit Office (SAO) represented a rather non-traditional source of evaluation of the implementation of digital technologies in the Czech Republic. The audit focused on the period between 2011 and 2018, and the goal was to assess whether the measures and projects related to developing education digitalization in the Czech Republic effectively contributed to the fulfillment of strategic goals in this field (Audit, non-paged). The audit concerned a

[14] The Union of Computer Specialists z. s. [*Jednota školských informatiků*] is a professional organization (registered association), which associates pedagogues and experts focused on the ICT in the school system. The UCS was created in order to acquire and spread knowledge and experience on the use of ICT in education both in the CR and abroad and to actively participate in the introduction and use of ICT in education (http://www.jsi.cz/).

period longer than the implementation of DES, and it did not focus exclusively on the Ministry of Education, but also on several selected schools and companies that were the partners of the schools in implementing the projects (in teacher training, creating digital education materials, etc.). This is a rather extensive document, and the following quote from the conclusion seems completely fundamental (Beznoska, 2019, p. 3):

> The MEYS [Ministry of Education – authors' note]...did not provide the appropriate offer of further education for teachers and digital education sources. At the same time, the MEYS did not introduce a standard of digital competences for teachers into practice, and in that manner, it did not set a technical standard for the equipment of schools with ICT...Therefore, according to the SAO, the MEYS did not create the conditions necessary for the successful education digitalization development in the long term or for the improvement of digital literacy. The MEYS did not make systemic changes in education that would ensure the desirable digital competences of students and teachers and demonstrably improve their digital literacy...The measures implemented by the MEYS and other projects connected to education digitalization therefore did not effectively contribute to the fulfillment of goals in this field.

When reading the conclusion of the SAO report, it is necessary to understand that it mapped the situation until 2018, which means that some activities had already been completed, such as the adoption of the Digital Competence Framework for Educators (DigCompEdu) as a standard for the digital competence of a teacher in the Czech Republic. More recent documents, such as the UCS report, suggest that the "adoption" of the framework does not yet represent its practical use. The SAO report is very critical, but at the same time, it shows how many projects were supported and how many funds was expended. It is one of the very few sources that explicitly published at least some specific economic data. The SAO report also shows that the implemented measures do not aim for principal transformations of the school system and education, but that the digital technologies are meant to rather complement the traditional school education. The trend of low emphasis on students and their competence in the field of digital technology thus continues. The planned communication of the DES goals to the general public lags far behind as well. Parents continue to learn very little about the meaning of the integration of digital technologies into school education or about the wider contexts of the process.

On the other hand, it cannot be said that the Ministry of Education has been completely passive in terms of introducing ICT into schools. In recent years, the Ministry has supported the schools in the field of introducing digital technologies through grants ("ICT templates"), which are co-funded by the EU. In addition, these projects are in the "simplified reporting" regime, through which the Ministry tries to decrease the administrative burden related to these projects. Within the implementation of the DES, the Ministry of Education also supported activities leading to processing documents for revising FEPs, for writing new textbooks, for teacher education, and for organizing conferences. All pedagogical faculties (faculties

educating future teachers) in the Czech Republic participate in these activities. These projects are also supported by EU funds.[15]

The wider contexts of the integration of digital technologies into education involves one more important Czech political document, which focuses on the support of the development of digital literacy in society – the Digital Literacy Strategy of the Czech Republic for 2015 to 2020, written in 2015 (further referred to as the Digital Literacy Strategy), which was created by the Ministry of Labor and Social Affairs. This document focuses on the development of the digital literacy of citizens, and its main goal is to support the competitive capacity of the economy, adaptability of human resources, and the quality of life of individuals. Its priorities include the support of the family; the goal is to increase the family ability to take opportunities and to eliminate the risks connected to the anchoring of digital technologies in the family, school, and free-time spaces (Ministry of Labor and Social Affairs, 2015).

The Digital Literacy Strategy explicitly mentions the importance of cooperation between families, schools, and free-time institutions. The document reflects the importance of the usability of digital technologies in informal teaching. Even though one measure of the strategy is "to increase the availability of relevant data for monitoring and evaluating the status of digital literacy in the individual priority spheres of this strategy" (Ministry of Labor and Social Affairs, 2015, p. 76), at the time of writing of this book, little information based on empirical data was available on the fulfillment of goals.

2.4 Conclusion

The problems of the use of digital technologies in education are often discussed in various fields and contexts. Digital technologies are an important topic for education policy, which represents one of the key contexts/frameworks by which digital technologies are implemented into education, but it represents only one framework of our research.

We have described the development of the education policy in the Czech Republic in the field of digital technologies in detail. After the fall of the Communist regime in 1989, Czechoslovakia was no longer isolated from the developed world, and its education policy started to gradually reflect the European context as well. The education policy in the Czech Republic in the field of digital technologies in the last two decades can be illustratively divided into phases, as described in the report "Digital Education Policies in Europe and Beyond: Key Design Principles for More Effective Policies" (Conrads et al., 2017). This

[15] More about these projects is available at https://imysleni.cz/about-the-project and https://digigram.cz/ (in Czech). These projects were in progress at the time of writing.

approach makes it possible to perceive Czech politics in the European context and to remember national characteristics.

The first phase of the policy (after 2001) in the Czech Republic focused especially on equipping schools with infrastructure and on connecting schools to the Internet. These priorities were identical in other European countries. The education of teachers was among the goals in the first phase of the policy in the Czech Republic, but the focus was primarily on operational abilities in the use of digital technologies and less on the use of ICT by pedagogues. The compilation of electronic materials was also among the priorities of the education policy. With certain simplification, the goals can be summarized thus: school equipment was the first priority, followed by the pedagogical aspects of integrating digital technologies into education.

According to the report by Conrads et al. (2017), the second phase of education policies in Europe emphasized teacher preparation, the development of teacher and student competences, and the compilation of digital content. The focus on "educational innovation" and the integration of ICT into the innovation processes within school systems were also significant (Delrio & Dondi, 2008). In the Czech Republic, both phases merge into one another to a certain extent and cannot be unequivocally distinguished, because teachers were a priority in the first political documents. The diffusion of the first and the second phase in the Czech Republic is probably caused by the fact that the first national documents were adopted with a certain degree of delay in comparison to most European countries. At the time these measures were adopted, the education policy in other countries was already shifting its attention to the education of teachers and their competences. At the same time, the school equipment had to be taken into consideration, because the level of equipment of Czech schools had been very inconsistent since the 1990s. The implementation of ICT into education was perceived as an education innovation in the Czech Republic, at least in political documents. With a certain degree of simplification, the Czech Republic is currently situated between the second and the third phases of education policies.

The third phase of education policies (approved after 2010) is characterized as: "better linking the systemic and the operational policy levels and, on the other, combining pedagogical competence development with the provision of digital devices or resources" (Conrads et al., 2017). This phase is trying to correct the weaknesses of the previous policies, and it emphasizes the key role of teachers in the meaningful implementation of digital technologies into everyday practice. Lately, the Czech education policy has emphasized the innovation of educational methods through digital technologies and the digital competences of students and teachers who will be able to use ICT in lessons and thus implement pedagogical innovations and not merely operate digital technologies. Equal access to digital study materials is also one of the priorities.

The implementation steps, specifically the fulfillment of political goals and the implementation of the proposed measures in school practice probably represent

the largest challenge. No completely operational connection of "systemic and operational policy levels" is available. In this context, in accordance with Elmore (2004), it is possible to consider the Czech education policy manifesting certain characteristics of a "symbolic policy" intended primarily to demonstrate a symbolic interest in a topic by adopting various concepts and strategies, thus acquiring political favor, thereby de facto terminating the professed interest in the topic. The subsequent implementation steps, including funding and the evaluation of these activities, therefore remain out of the field of view. This raises the concept of a "parallel game" in which the principals and teachers bring this symbolic policy to life by only implementing superficial changes with no actual impact upon the quality or principles of teaching or learning with the support of digital technologies. In that way, they play some sort of a "game of change or innovation." If there is no feedback, the same mistakes can be made and then repeated over and over again. In Norway, the strategies and implementation of the policy can be changed, modified, or innovated rather quickly and flexibly thanks to regular evaluations (Zounek et al., 2018b). No such systematic evaluation systems or research exist in the Czech Republic and the education policy aim changes are thus very difficult and slow.

The Czech education policy has been oriented mostly toward the implementation of digital technologies in schools and toward the teachers' work, especially in the first two phases. It has not seriously considered other participants or institutions outside of schools, such as parents or free-time institutions. Cooperation among the ministries has been nonexistent and the cooperation and involvement of regions and school authorities has not worked, either. Only in the last couple of years has a wider range of political documents been seen in the field of nonformal or informal education. The development of digital literacy outside of formal education, and, generally speaking, lifelong education is a challenge for the future. It is connected to an improved awareness outside of school education on the opportunities and limitations of digital technologies in education and in various forms of teaching.

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Part I
Digital Teens' Use of Digital Technologies in the School Contex

Chapter 3
Teachers and Their Use of Digital Technologies in School

Abstract In this chapter, we present one of the important contexts of the present-day life of young people: school. Students spend a large part of their time in school and they encounter digital technologies in various (learning) situations. We look in more detail into the life of schools, focusing on how Czech schools are equipped with digital technologies, how teachers use the digital technologies in their lessons, what the teachers' skills and abilities to use ICT are, and how the teachers approach the digital technologies and their use in teaching and learning.

We do not limit ourselves to national or international qualitative studies; we also let the students themselves speak. In the areas outlined above, we present the results of the relevant quantitative studies and then describe how the students see the given situation on the basis of our qualitative research. We are interested in how the students evaluate the school equipment, what they think of their teachers' ability to use ICT in education, and how they perceive their teachers' use of digital technologies directly in lessons. The combination of quantitative and qualitative approaches enables us to look into the life of teachers and students in the school environment in a more complex way.

In the first part of the chapter, we delimit the topic of this chapter as a whole. We then present our research questions and describe the methodology of this part of the research, including the sources of the empirical data. In the subchapters, we gradually present answers to the defined research questions. In the conclusion, we summarize all our findings and interpret them in wider contexts.

Keywords Primary schools · Teachers · Teaching · Transmissive style · Digital technologies · Competences · ICILS · TALIS · Students

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3.1 Theoretical Background

In Chap. 2, we focused largely on the education policy in the Czech Republic, concentrating on the implementation of ICT primarily in formal education. We showed that in this field, Czech politics primarily aligns with other European countries, though certain specific national characteristics remain. The priorities have gradually shifted from equipping schools with digital technologies and creating digital teaching materials to an emphasis on preparing teachers and finally to an effort to innovate education itself through digital technologies, which requires that teachers are competent in using ICT potential while being aware of the possible risks or limitations of digital technology use in education.

Indisputably, teachers play a key role in the introduction of digital technologies into school education (Almerich et al., 2016; Erstad et al., 2015; Somekh, 2008). The challenges of digital education in teachers' work have been an important topic in present-day education and pedagogical research for quite some time (Fisher et al., 2006; Hermans et al., 2008; Petko, 2012; Prestridge, 2012; Smeets & Mooij, 2001; Tondeur et al., 2017). The subjects of interest include the teachers' pedagogical and technological competencies (Caena & Redecker, 2019; Mishra & Koehler, 2006; Tondeur et al., 2008; Redecker, 2017) and teachers' beliefs about education that affect how they use digital technologies and sources in teaching (Inan et al., 2010; Suárez-Rodríguez et al., 2018). Themes of interest also include the actual availability of the infrastructure and its level, which significantly affects how the teachers use digital technologies. At the same time, the availability of the infrastructure does not (automatically) lead to its meaningful use and/or to a change or innovation in teaching and learning (Cuban et al., 2016; Schleicher, 2015).

The way that digital technologies are implemented into school life is the pivotal factor in education transformation and teaching results. The manner in which teachers work with ICT both in and outside of the classroom can also be considered a key factor. In accordance with Hinostroza et al. (2008), digital technologies can be used to support traditional education in the classroom as well as to develop new teaching procedures or learning options. Interactive boards, whose largest benefit lies in the program equipment enabling the expansion of teaching with multimedia materials or sources, represent an example of the support of traditional education. In comparison, the use of the Internet and online services can help develop new teaching procedures that would not be possible without these technologies. Various online teaching systems allow the teacher to acquire data on the course of the learning process that can be used for various analyses or evaluations of student learning (Juhaňák & Zounek, 2019). The use of mobile technologies that enable studying almost anywhere and anytime is another example of the expansion of the learning options, even beyond the walls of a traditional classroom (Hinostroza et al., 2008). In addition, digital literacy is being developed by using mobile technologies in various subjects or learning activities. The huge advantages of the use of mobile technologies include personalized learning, in which the user can tailor not only the given mobile device, but also its use in teaching or education. This is connected to

a larger orientation of education toward the students and their greater responsibility for their own learning. Teachers can also personalize their own devices, both for their own education and for their teaching (Neumajer et al., 2015; Sung et al., 2016). It is important to know how the teachers themselves perceive the role of ICT in teaching and learning, how skilled they are in the use of digital technologies in education, and what they expect from students in the field of ICT in subjects focused on digital technologies and in other subjects as well. If digital technologies are to have a truly positive influence upon teaching and learning, an investment of time and effort from the teachers themselves is necessary (John & Sutherland, 2007; Zounek & Šeďová 2009).

At the same time, the potential of ICT in teaching and education leads to thoughts about new approaches to teaching that, in comparison to the former/traditional teaching, include the options of digital technologies and veer from the traditional teacher-centered perception of teaching (Churchill, 2017; Kereluik et al., 2013; Kozma & McGhee, 2003). We refer to this as a "twenty-first century education" and the basic differences between the new concept and traditional teaching are listed in Table 3.1. This division of education is used only to explain and illustrate the basic differences between two concepts of teaching.[1] It does not mean that the traditional concept of teaching is automatically synonymous with outdated or unsuitable approaches in education. However, traditional education is often criticized for an excessive emphasis on rote learning or the passivity of students in learning, as well as because the options of digital technologies are not being utilized (Brdička, 2003; Zounek & Šeďová 2009).

Table 3.1 Some aspects of traditional education and twenty-first century education

Traditional education	Twenty-first century education
Linear presentation	Hypermedia presentation
Larger teacher control	Larger student freedom
Limited sources of information	Unlimited sources of information
Emphasis on what the student is learning	Emphasis on how the student is learning
Learning in school	Life-long learning
Less emphasis on dialogue and critical thinking	More emphasis on dialogue and critical thinking
Questions and tasks have correct answers	Questions and tasks have relative answers
Directive goals and educational content	Educational goals and content are agreed upon with students
Memorization of learned information	Critical work with found information
Digital technology as a media channel	Digital technology as an intellectual partner
Learning from digital technologies	Learning with digital technologies
Learning by observing	Learning by doing and discovering

Source: Processed and edited in accordance with Makrakis (2005) and Churchill (2017)

[1] Various names can be found for new and old models of teaching and learning. Churchill (2017) used teacher-centered and learning-centered practice.

One of the basic building blocks of twenty-first century education is constructivism, which perceives the importance of the intrinsic qualifications of a student for learning, but also the importance of their contacts or interactions with the environment, originating in the premise that the students themselves construct or build their own knowledge and thus are not just passive recipients of information from their surroundings (Jonassen et al., 2003; Oliver, 2002; Sandholtz et al., 1997; Zounek et al., 2016). That is why "student-centered education" is one of the basic requirements of digital pedagogy (Lu et al., 2010; Sandholtz et al., 1997). Students can influence and plan their own education and thereby become responsible for it (Jonassen & Rohrer-Murphy, 1999; Oliver, 2002; Smeets et al., 1999). Even within the rules of constructivism, the teacher plays an important role (Cox et al., 1999; Higgins et al., 2012; OECD, 2015; Smeets & Mooij, 2001). For example, the teacher plays the role of a facilitator in planning and organizing of learning, an assistant, and a guide (Dede, 2008), and they can become a "student" when learning from their own experience or from their students (Zounek & Šeďová, 2009).

Focusing on student results in the new educational concept, the most important skills and abilities allow students to live in twenty-first century society. These include creativity, critical thinking and problem solving, the ability to cooperate, and a mindset ready for lifelong learning (Anderson, 2008; Churchill, 2017; OECD, 2008). "New Literacies," defined as social practices mediated by digital technologies, reflect the importance of ICT in the present-day world and thus differ from traditionally perceived literacies, forming an important component of the "equipment" of present-day students (Knobel & Lankshear, 2014). One of the pivotal new literacies is digital literacy, defined by Martin and Grudziecki (2006, p. 255) as "the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process."

This concerns searching for and using information in digital form, but much more importantly it involves an entire range of ICT-related activities that permeate all human actions. As stated in Chap. 2, the Czech curriculum primarily works with a concept of information literacy focusing on the use of digital information technologies, orientation in the world of information, creative work with information, or the use of information technologies in further education or in practice. This delimitation is rather narrow and lacks an emphasis on communication using technologies or a reflection on ICT use in various activities. Nevertheless, on a very general plane, this perception encompasses the basic fields of learning and life with digital technologies. In the Czech Republic, digital technologies are taught as a separate compulsory subject; however, digital technologies should be included in all other compulsory subjects within the curriculum of the given school stage, because they are understood as a cross-curricular theme. Teachers of all subjects should therefore incorporate digital technologies into teaching their subjects and thereby allow the students to apply digital technologies, educational software, and information sources in their education (Ministry of Education, 2017).

This chapter focuses specifically on the following questions:

- How are Czech schools equipped with digital technologies from the viewpoint of national and international studies?
- What is the adolescent view of the equipment of schools with technological means?
- How do teachers use digital technologies?
- How do adolescents perceive the use of digital technologies by teachers?
- What are the teachers' skills and abilities in terms of using digital technologies?
- How do adolescents perceive their teachers' skills and abilities in using digital technologies?
- How do teachers approach digital technologies and their use in teaching and learning?
- How do adolescents perceive the teachers' approach to digital technologies?

We used several research methods and data sources to acquire responses to these questions. In Czech pedagogy, studies or systematic or long-term research mapping the implementation of digital technologies into schools, teachers' work, and the formal teaching of students are not very common (Arnseth et al., 2016; Zounek et al., 2018; Zounek & Tůma, 2014). As stated in Chap. 2, there has been no systematic evaluation of the steps of the ICT incorporation policy on the national level. The progress of "digitalization" was recently mapped by the Czech School Inspectorate (CSI), which issued several important reports that we used in our research. The report from September 2017 (Czech School Inspectorate, 2017) is probably the most important in this regard. The inspection activities were performed during the 2016/2017 school year using an on-line questionnaire for primary and secondary school principals. The thematic report included a focus on material equipment in schools and on education using ICT. We also used some data from older inspection reports focused specifically on the matter of equipment with digital technologies in primary schools (Czech School Inspectorate, 2009). We drew information from reports mapping ICT at the lower stage of secondary schools, attended by some fifteen-year-old students. This is not a "traditional" research investigation, but rather a monitoring of the actual conditions. Nevertheless, the investigations work with samples containing several hundred schools and hundreds of teachers and students. Older reports (Czech School Inspectorate, 2014) used an online electronic questionnaire with a response rate of over 70% of primary schools, which amounted to approximately 2700 schools. These reports thus provide an overview of the problems of equipment and use of digital technologies in Czech schools.[2] We had access to the results of partial research investigations and research projects (Hrtoňová et al., 2015; Zounek, 2006; Zounek & Šeďová, 2009) that mapped the implementation of digital technologies in the environment of primary schools, ICT in the work of Czech teachers, and the factors that affect the acceptance of e-learning by Czech teachers.

[2] These are available only in Czech.

International large-scale assessments (ILSAs) focusing primarily on other topics but containing data on teachers and digital technologies are important sources of data. These include the Teaching and Learning International Survey (TALIS)[3] and the International Computer and Information Literacy Study (ICILS).[4] These studies collected huge amounts of data that remain largely untapped in the Czech context (Potužníková et al., 2014). The same applies to the *ICT in Education, Benchmarking access, use and attitudes to technology in Europe's schools* study (further referred to as the *Survey of Schools*) and to the more recent *second Survey of Schools: ICT in Education* research (further referred to as *second Survey of Schools*). For this reason, this chapter uses primarily research reports from these studies, summarized in more detail in Table 3.2. We used a topical content analysis for the research reports (Attride-Stirling, 2001; Boyatzis, 1998; Krippendorff, 2019; Tuckett, 2005).

In the qualitative section, we used twelve semi-structured interviews conducted with six fifteen-year-old students and three focus groups interviews conducted in three different classrooms of fifteen-year-old s as the data source. All interviews were recorded on a voice recorder and subsequently transcribed word by word. These transcripts were then uploaded into the Atlas.ti program, in which open coding was used as the basic analytical technique (Flick, 2009; Charmaz, 2006). We used deductive processes in which we searched the relevant data for subjects relevant to the topics acquired by a qualitative analysis.

3.2 Level of Equipment of Czech Schools with Digital Technologies

Adequate equipment of schools and individual classrooms with a technological infrastructure is one of the basic prerequisites of ICT integration into teaching and into the teachers' work in general. Access to infrastructure is therefore a necessary prerequisite for its availability for use in teaching and learning (Gil-Flores et al., 2017). For these reasons, the introduction of digital technologies into schools is usually among the important implementation steps in most European countries. In the Czech Republic, the schools started to individually equip themselves with digital technologies in the 1990s. Nevertheless, only in the first decade of the new millennium did the effort to equip schools with technical infrastructure grow much larger. According to the findings of the *Survey of Schools* research, in 2011, most (87%) Czech eighth graders (14 years of age) attended "partially digitally equipped schools" (the EU average was 68%). Approximately 9% of the questioned students attended "highly digitally equipped schools" (the EU average was 24%). Less than

[3] More details at http://www.oecd.org/education/talis/

[4] More details at https://www.iea.nl/studies/iea/icils

Table 3.2 International studies subjected to analysis

Research	Characteristics	Used data/research reports
ICILS	The teacher's questionnaire mapped the opinions on ICT in teachers of the reference classes (the classes whose students participated in the ICILS research) while the school questionnaire was filled in by principals or ICT coordinators	Preparing for life in a digital age: The IEA international computer and information literacy study international report (Fraillon et al., 2014). National report of the ICILS 2013 research (Basl et al., 2014)
TALIS	In the TALIS research, teachers and principals were directly questioned about the school environment in which the teaching takes place, and the conditions in which the teachers and principals work	National report of the TALIS 2013 research (Kašparová et al., 2014). TALIS 2018 international research: National report (Boudová et al., 2019)
SURVEY OF SCHOOLS: ICT IN EDUCATION	The goal of the research is to provide comparative data and markers in the field of ICT implementation in European schools. 31 countries participated in the research. The respondents included students, teachers, and principals of primary and secondary schools. Data was collected in the fall of 2011)	Survey of schools: ICT in Education (European Commission, 2013). The Use of ICT in Education: A survey of schools in Europe (Wastiau et al., 2013)
2ND SURVEY OF SCHOOLS: ICT IN EDUCATION	The goal of this research was to provide detailed information related to access, use, and attitudes toward the use of ICT in education. 28 EU member states as well as Norway, Iceland, and Turkey participated in this research. The respondents included head teachers, teachers, students, and parents (European Commission, 2019a)	*2nd Survey of Schools: ICT in Education* (European Commission, 2019a, b)

5% of students attended "less" digitally equipped schools, which is a number below the EU average (European Commission, 2013).[5]

The results of the newer *2nd Survey of Schools* from 2019 stated that on the ISCED 2 level, approximately 50% of Czech students attend "highly digitally equipped and connected schools"; the other half attends partially digitally equipped and connected schools (European Commission 2019a, p. 39), which is a ratio close to the EU average. Thus it is clear that in comparison to 2011, the number of very well equipped schools has increased significantly. On the other hand, half of schools could still improve in terms of equipment or Internet connection. The situation

[5] Highly digitally equipped schools: relatively high level of equipment (available devices include computers, interactive boards, digital cameras, overhead projectors, fast broadband Internet). High "connectivity" includes having a website, email, a virtual learning environment, and a local area network. Partially digitally equipped schools: less equipment (slow Internet connection, less than 10 Mbps). Less digitally equipped schools: same as partially digitally equipped, with limited Internet access, not broadband (European Commission, 2013).

varies significantly among the individual European countries. In Sweden, almost all students of this stage attend highly digitally equipped and connected schools; the other Scandinavian countries, Finland and Denmark, are in only a slightly worse situation. On the other hand, in Slovakia, a larger portion of students attend partially digitally equipped and connected schools (approx. 70%).

The topical CSI report from September 2017 provides a more detailed overview of the condition of equipment and use of digital technologies in Czech schools (Czech School Inspectorate, 2017). It confirms that in at least some areas ICTs are common in a vast majority of schools in the Czech Republic. No less than 99% of large primary[6] and secondary schools use some information system to manage school agendas and have a school website. Most schools also prepare and continuously update their own developmental plan for the field of ICT (Czech School Inspectorate, 2017).

The availability of the infrastructure to students is a very important factor for a meaningful utilization of digital technologies in schools. Eighth graders (14 years of age) attend schools in which the computers (or laptops) are mostly located in computer labs (European Commission, 2013). However, the computer labs are less accessible, because computer science, are held in the computer lab for most of the day (Czech School Inspectorate, 2017). In this case, this trend is ongoing, because a similar problem was mentioned by teachers in our previous research, which took place between 2006 and 2008 (Zounek & Šeďová, 2009). That means that computer labs practically cannot be used for other subjects. This is due in part to the fact that most schools only have one to three computer labs and the number of labs is connected to the size of the school (Czech School Inspectorate, 2017). Desktop computers or laptops unequivocally predominate in schools; the ratio of tablet computers in schools is less than 20%. In very limited cases, schools resort to the BYOD (Bring Your Own Device) principle due to inadequate technical equipment or possibly to the problematic provision of management and operation of the infrastructure allowing the use of student devices (Czech School Inspectorate, 2017). There is a question about the degree to which the limited use of the BYOD principle is caused by low teacher competence or a lack of pedagogical skills, because an effective inclusion of BYOD into teaching requires a certain deviation from traditional approaches.

As regards the use of mobile technologies for learning, Czech primary school students (ISCED 2) use smartphones the most often, with 41% using them at least once per week, which is higher than the EU average (30%). Students' own tablet computers and laptops are used less than the EU average. In Czech secondary schools, the situation is different, because the rate of use of student laptops or tablet computers for studying is similar to the EU average, but much fewer students use smartphones; specifically, 32% of Czech students use smartphones while the EU average is 53% (European Commission, 2019b). Interestingly, according to the *2nd Survey of Schools* (European Commission, 2019a) the use of students' own devices

[6] Primary schools with more than 150 students are considered large in the context of the report.

for studying in school remains the same in the EU in the long term (in comparison to the previous research from 2013), in which especially the use of laptops remains rather low. Nordic countries are the only exception.

The Czech Republic is one of the countries in which many schools are equipped with interactive boards. According to the *Survey of Schools* (European Commission, 2013), among eighth grade students the ratio was 63 students per one interactive board; the EU average was 100 students per board. The results of the more recent *2nd Survey of Schools* (European Commission, 2019a) show similar data: there were 65 ISCED 2 level students per one interactive board in Czech schools, and the EU average was 109 students per one interactive board. On the other hand, fewer Czech schools used online methods in teaching. Only 36% of large primary schools use some learning management system (LMS), such as Moodle, or cloud services in teaching. In smaller primary schools, the ratio is even less than 20%. In secondary schools, such online services are used by about 61% of schools (Czech School Inspectorate, 2017). The Microsoft Windows operating system is characteristically a dominant part of the equipment of Czech primary schools. In 2014, 93% of primary schools stated they had no computers with an operating system other than Microsoft Windows (Czech School Inspectorate, 2014).

The effort to provide schools with adequate infrastructure has one rather new challenge both for the educational authorities and for school administrations – the gradual and rather fast obsolescence of digital technologies and the subsequent renewal of the equipment. This is a very relevant topic in the Czech Republic, because in the conclusion of the CSI study, the authors warned that the ratio of schools with gradually more obsolescent technical equipment is increasing significantly.[7] This is proven by their laconic summary of the situation: "If a teacher (…) has a computer at their disposal, they usually share it with other teachers and it is a computer that is, with a probability of over 84%, seriously obsolescent and very difficult to use for all types of activities that have to be done safely and efficiently. With a probability of 29.3%, this available computer is almost unusable within this meaning" (Czech School Inspectorate, 2017, p. 13). Again, this is a long-term problem because in our previous research (Zounek & Šeďová, 2009) some primary school teachers stated that they shared an older computer with up to six colleagues, and merely logging in to their personal account was such a lengthy procedure that it was basically impossible for the teachers to read their messages during the school breaks.

Inadequate staffing of the ICT administrator position (focused on the technical management of the infrastructure) or ICT coordinator position seems to be another problem. In most cases, there is in fact no ICT administrator position in the school (only 35.1% of primary schools have a "technical administrator"). This leads to situations in which the administration of digital technologies in schools falls to the ICT teacher or ICT coordinator. For the ICT coordinator, this means having less

[7] According to the results from 2009, more than half of the computers (56%) designed for teaching in primary schools were less than five years old; the ratio is now less than 10% (Czech School Inspectorate, 2009, 2017b).

time for their own job, which should primarily concern the coordination of ICT in the school and the methodological support of teachers in the use of digital technologies in teaching (Czech School Inspectorate, 2017).

In terms of the students' views and how they perceive the level of technological school equipment, it truly is an aspect of school that is perceived and reflected upon by the students. In a student interview conducted in 2018, Jiri remembered that the level of technical equipment of specialized classrooms was something he noticed when visiting his school on an open-house day when he and his parents were choosing a secondary school. "I was there on an open-house day, and there were sonars and graphs on the computers." Similarly, when describing technological equipment, Matej's assessment was that "there are cool interactive boards, projectors and so on in the labs. So it is on quite a high level." It is clear that students see the school's level of equipment with digital technologies, and the school technical infrastructure thus affects their everyday experience with digital technologies in school.

The fact that in most Czech schools, digital technologies are located in computer labs was reflected in our interviews with students, in which the students primarily associated digital technologies with computer labs. On the other hand, the interviews also included the topic of technical equipment in labs and classrooms for specialized subjects such as physics, biology, geography or chemistry. As regards the equipment of regular classrooms, the students considered it normal for the classrooms to be equipped at least with a computer for the teacher and possibly an overhead projector connected to said computer. As Matej stated: "There's one computer for the teacher in every classroom." At the same time, students noticed that teachers did not always use these computers in the classrooms directly in the course of teaching in class, but that they used them to prepare for their lessons or to work with the school information system (for example for entering grades). Renata explained: "They (the teachers) don't use them (the computers) in lessons. But they prepare for the lessons on them and they give us grades in the Edookit."[8]

We mentioned the rather high ratio of interactive boards in Czech schools. However, as the experience of some students showed, the availability of the interactive boards alone does not necessarily reflect in their effective integration into teaching. Renata described an example of interactive board use: "We have them (interactive boards) in about three classrooms and we used to work with them only when we were small. Otherwise, the teacher writes on them and we can play a game on it, if we have time. But we don't use them otherwise. But we have these projectors…" If an interactive board is only used as Renata described, it represents an unnecessarily expensive piece of equipment that could in most cases be replaced with an overhead projector connected to a computer or perhaps even a traditional blackboard. Renata's description thus suggests another topic: the didactically oriented use of available digital technologies by teachers themselves directly in

[8] Edookit is a School Information System including tools such as Online Gradebook, Parent Portal, Student Information System, Learning Management System, Scheduling and Communication Tools, etc. (see https://www.edookit.com/en)

lessons. In this case, the use is limited to teaching younger students and to supporting the traditional transmissive teaching; this topic is discussed in more detail in Sect. 3.3.

School information systems, specifically the online administration and teaching systems used in schools, represent another element of school technical infrastructure that the students paid attention to in the course of our interviews. However, the availability and use of these systems was seen by students as rather varied. Matej saw the use of these systems as standard: "We have an electronic roll book, so they register attendance before every lesson, enter grades and so on." Incidentally, this corresponds with the CSI data that reported a significant spread of online systems of this type to schools. Some students are capable of recognizing the benefits of these systems and thus see their use in school as positive, as Matej stated: "We have everything there (in the electronic system). Homework, events, study materials, everything. (we don't have to write it down), that's an advantage. (…) I like it. (…) I like it much more than having to go to the teacher with a student record book and writing down the grades and so on. I can just see it there." On the other hand, some students had negative opinions of the use of school information systems. Renata offered such an example: "They wanted the Edookit, the teachers wanted it, but then they don't use it the way they should. We didn't want it, we wanted regular student record books, but they made it so that the attendance and everything is there. But they should enter tests, homework, they should put everything in there so that it would be there (…) but half of the teachers don't do it, don't enter homework, don't do anything." In this case, interestingly, the students wanted to keep using the traditional student record book, but teachers wanted to switch to an electronic agenda. This is understandable on part of the teachers, because the online system offers a whole range of functions within a single system. Apparently, the introduction of the system was not based on a complete agreement about its use among the teachers. The system was therefore used somewhat haphazardly, resulting in a rather unclear situation for the students, which can cause many issues. In this situation, the school administration may have failed in its duties as well by not leading by example, by insufficiently supporting the set strategy (the selected information system), and by not requiring the strategy without exceptions. The students did not see the benefits of such an online system and thus they tended to support the student record books, which are clearer and more meaningful for them.

Concerning the availability of digital technologies within the school, the availability to the students themselves is an important factor. With regard to the dominant position of computer labs, we can at the same time speak not only about the availability of digital technologies directly in classes, but also about the accessibility of the computer labs. It can be considered a certain standard for the computer labs that they are available exclusively for the purposes of teaching the subject computer science. Petra's statement was an example of such an approach: "Well we only go there for the information technologies, or if we have some substitute teacher or something and if there is no other classroom available, then we are in the computer lab." On the other hand, some students also spoke about certain options or situations in which they are allowed to use the computer lab. Matej mentioned students having access

to the devices in the specialized classroom under certain conditions in his school: "In the computer lab, there is also a study room and we can borrow the keys to it and use the computers at our own risk and search for stuff." Natalie provided another example: "We have two (computer) labs, but it is not really free, only if I know that someone has IT lessons there, I can ask the teacher if I can work on something there if they have a free computer."

Therefore it seemed that computer labs were not strictly off limits to the students beyond information technology subjects, but that more or less formalized processes through which the students could use the information technologies were starting to appear. Apparently, the initiative of the students themselves (i.e. the willingness to ask the teacher if they can use the lab) played an important role here, which could mean that the computer lab remained virtually inaccessible for less proactive students or for students who didn't think of this option. The availability of a simpler solution on part of the student could represent another reason not to use the computer labs. As Matej explained in connection to the use of the computer lab: "I haven't used (it) yet. I have the Internet on my phone, so if I need to find something, I search for it on the phone. It's faster, I don't have to get the keys and so on." This statement showed that the problems of availability of digital technologies to students is a rather complex phenomenon in schools. On one hand, the access to digital technologies, specifically to computer labs, could be rather complicated in certain schools; on the other hand, the access to the computer lab need not be very relevant to the students if they have a more accessible alternative available.

Concerning the computers in regular classrooms, the students generally viewed them as the teachers' computers and did not even think about being allowed to use them: "I have never tried it and I probably never will," Petra said. But this was not always the case. Matej reported that in his class, the students originally had been granted access to this "teachers' computer" and could use it. But a change came later and it was forbidden: "It was quite popular to set up various cursors and switch the mapping of the mouse buttons and other pranks like that (…) and then playing some YouTube videos loudly, so that's why they forbade it." Even though the ban can be understood as a logical solution, it is not the only solution. If there were clear rules for the use of such a computer (including setting up a guest account for the students), the students would be able to use the computer for more than "pranks."

With regard to the fact that in common classrooms, there are usually no digital technologies available besides the teachers' computer, the use of technological means owned by the students themselves plays an important role in teaching. Jiri provided an example of the use of one's own digital technology directly in lessons allowed by the teacher: "In the lesson, we are allowed to pull out our phones and search for something. In language studies, we use translators all the time. That's almost all the time. The phone's virtually on the desk all the time." The use of a smartphone seems to be more acceptable to the teachers than the use of a laptop. Jiri later described a situation in which his classmate was allowed to use a laptop during lessons: "My friend had hurt his hand, he tried, but it was so clear that his hand was hurt, so he had to take notes on a laptop. It's hard to say what would they have said

if his hand wasn't hurt. Some teachers would completely forbid it, some would allow it." Similarly, Matej said that the use of a laptop did not commonly occur in the course of lessons: "Well, I would have to ask the principal and then I guess the teacher of that subject and if stated a legitimate reason, if both the principal and the teacher allowed it, then I guess I could use it." Jiri's and Matej's experiences support the quantitative studies showing that smartphones are used in the classroom much more frequently than laptops. Interestingly, in Jiri's case, the laptop was "permitted" only under the extraordinary circumstances in which a student was injured and couldn't write with a pencil. Similarly, Matej spoke about the need for "a legitimate reason" to be allowed the use of a laptop. Renata presented another example, albeit a less strict approach: "We are allowed to take a laptop and work on it. Well, in the course of a learning process. (…) we cannot use it for personal stuff, just for learning." Even in this case, it is clear that the use of a laptop in lessons was governed or limited in a certain way.

The student use of their own digital devices in the course of lessons is necessarily related to the possibility of connection to the Internet in schools, specifically its availability directly to the students. The availability and possibly the quality of the Internet connection using Wi-Fi is apparently rather varied in Czech schools (see Czech School Inspectorate, 2017); this affects the students' options to use the Internet directly in lessons and also its possible use during school breaks. Petra explained the need to connect to Wi-Fi during lessons: "When the teachers ask about something in lessons and we are supposed to Google the information and nobody has enough data [mobile data – authors' note], then they can at least use the Wi-Fi." The responses of some of our respondents suggested that the process of improving equipment in schools was ongoing: "We did not have Wi-Fi in our classroom at the beginning of the year, but now we have it and I think that it is basically in almost every classroom," Petra continued. However, some schools still lack an adequate Internet connection, which corresponds with the findings of the quantitative studies. The *2nd Survey of Schools* (European Commission, 2019a) classified approximately 50% of Czech schools among "partially digitally equipped and connected schools." A possible example of such a school was described by Renata: "Our school is a bit behind and the Wi-Fi is weak and even the teachers often (…) they want to show us something on YouTube and they simply can't."

The analysis of our interviews with students provides information concerning the staffing of the administration of the digital infrastructure in schools. CSI data indicated the relatively frequent absence of an ICT administrator in the school, which leads to ICT administration often being left to the teacher of information technologies, who then also serves as a teachers' support in dealing with technical difficulties (Czech School Inspectorate, 2017). This is illustrated by Matej's experience, as he stated: "There are some teachers who if they can't get the sound to work, someone from the class helps them. Or if there is an issue, my classmates always try to get in on it and solve it. Then we call the IT teacher [ICT/information technology teacher – authors' note] and he solves it."

3.3 Use of Digital Technologies by Teachers

According to the ICILS research (Fraillon et al., 2014) a vast majority of Czech teachers have more than two years of experience using digital technologies, both in and out of school. The results suggested that when the research was conducted, the teachers had already had experience with digital technologies ranging over multiple years. This was confirmed by the *Survey of Schools* (European Commission, 2013) research, according to which a vast majority of European teachers had four or more years of experience with the use of computers/Internet in school. In the Czech Republic, 77% of teachers claimed four to six years of experience with computers, specifically the Internet. In compliance with expectations, in the Czech Republic, the use of digital technologies is most often reported by teachers of subjects focused specifically on the problems of digital technologies (100%), followed by teachers of humanities (86%) and natural sciences (85%), and teachers of Czech and foreign languages (each 77%). The differences between other post-socialist countries, such as Poland and Slovakia, are often small, suggesting similar approaches of the teachers of all the countries. In comparison to Norway and Denmark, a trend is clearly visible: ICTs are used significantly less in the Czech Republic and other post-socialist countries, especially by teachers of mathematics and national or foreign languages (Fraillon et al., 2014).

Figure 3.1 focuses on the specific digital technologies used by Czech teachers in teaching. In this figure, the conditions in the Czech Republic are compared to the average of the ICILS research. As is clear from the figure, with the exception of a

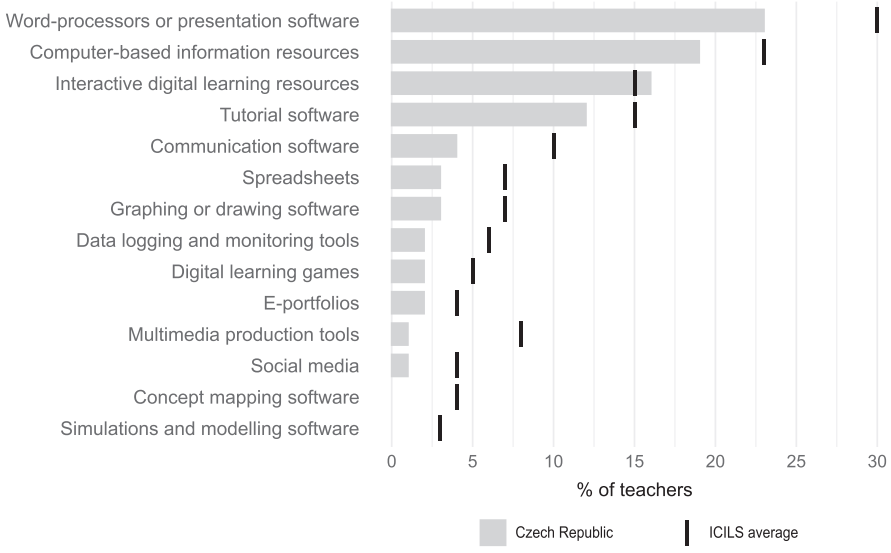

Fig. 3.1 Percentages of teachers using the following ICT tools for teaching in every/almost every lesson or in most lessons. (Adapted from Fraillon et al. (2014, p. 222–223))

single type (interactive digital learning resources), Czech teachers use all types of digital technologies below the ICILS research average, and these differences are statistically significant in all cases. Further, the figure shows that Czech teachers most often use word processors (e.g. Microsoft Word) and presentation software (e.g. Microsoft PowerPoint), computer-based information resources (websites, Wikipedia etc.), interactive digital learning resources, and tutorial software focused on practicing specific skills. The other listed tools and technological means (e.g. communication software, graphing or drawing software, digital learning games, e-portfolios, etc.) are frequently used by less than 5% of Czech teachers. Thus these tools are used very rarely or irregularly.

Even with the use of word processors and presentation software, the percentage of teachers claiming to use these means in every or almost every lesson is below 25%. This means that not even the use of these basic tools can be considered absolutely common in Czech schools. On the other hand, the presented figure makes it possible to discover that at the time the ICILS research was conducted, some tools were practically unused in all countries (e.g. social media, simulation programs). This may not necessarily be due to an unfamiliarity with these tools among teachers, but also to their unavailability in schools. For example, at the time of the research, social media were not as widespread as they are now.

Apart from the degree of use of specific technological tools, we can also focus on which teaching practices in classroom include the use of digital technologies. This is the subject Fig. 3.2, which once again clearly demonstrates that in almost all types of teaching practices, Czech teachers achieve values below the ICILS average; all differences are statistically significant except for *presenting information through direct class instruction*. In terms of specific types of teaching activities, the frequent use of ICT for the purpose of presenting information through direct class instruction clearly dominates among Czech teachers. By contrast, frequent use of digital technologies for providing remedial or enrichment support to individual students or small groups of students, enabling students to collaborate with other students (within or outside school), supporting inquiry learning, and mediating communication between students and experts or external mentors was claimed by less than 5% of teachers in the Czech Republic.

Figure 3.3 focuses on the frequent use of digital technologies in lessons during activities in which the ICTs are used by students themselves and indicates a largely similar situation. In all categories, Czech teachers range significantly below the average of countries participating in the ICILS research, and the differences are statistically significant in all cases. As regards the specific types of learning activities, the use of digital technologies for the purpose of searching for information on a topic using outside resources and working on short assignments (i.e. within one week) predominates in Czech classrooms. By contrast, learning activities such as open-ended investigations or field work, seeking information from experts outside the school, reflecting on their learning experiences, and communicating with students in other schools on projects are included in teaching by a very small percentage of Czech teachers (2% or less).

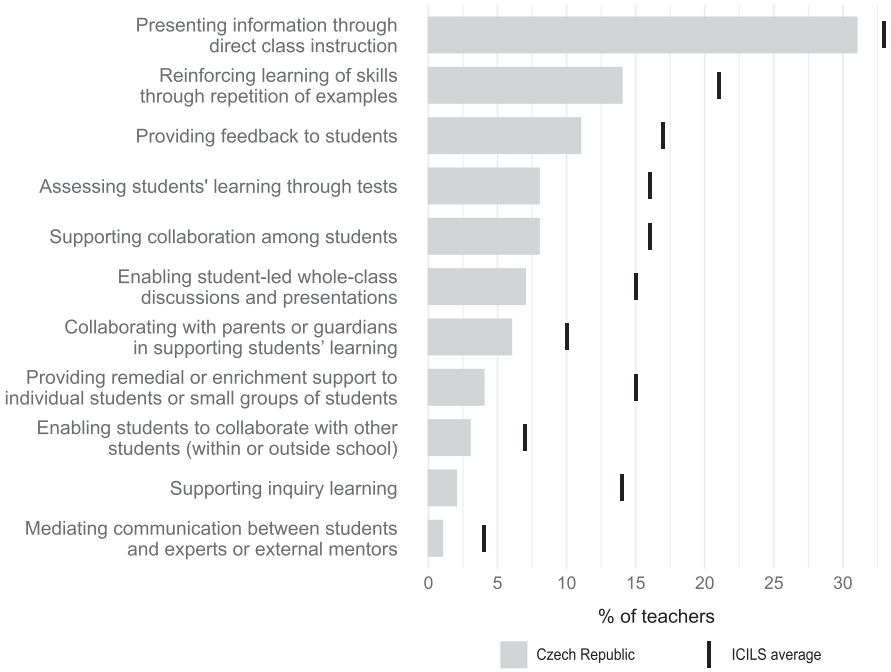

Fig. 3.2 Percentages of teachers often using ICT in the following teaching practices in classrooms. (Adapted from Fraillon et al. (2014))

Again, the data were collected before 2013 and we focus on primary schools. Therefore it is possible that the situation is different in 2021. Nevertheless, these very data may indicate the unused or unusable options of digital technologies in Czech schools. The fact that the teachers were not asked about the degree to which they use the individual activities without ICT in their teaching also represents a certain limitation to these results. This means it is not possible to deduce the degree to which this situation is relevant in relation to ICT use and the degree to which these results reflect the more general pedagogical focus of Czech education, which is still dominated by traditional pedagogy in which the teacher-centered approach is an important characteristic (comp. Churchill, 2017; Zounek & Šeďová, 2009; Zounek et al., 2020). However, the CSI results suggest persisting tendencies toward traditional teaching, showing that in both primary schools and secondary schools, frontal instruction still dominated. In 82% of the monitored lessons in primary schools (75% lessons for upper secondary education), teachers used the very frontal instruction, and the report even stated a slight increase in the usage of this type of education in primary schools in comparison to 2016/2017. In addition, in primary schools, this phenomenon was accompanied by a continuously decreasing occurrence of all other organizational forms of teaching (Czech School Inspectorate, 2019). This remains true even though the further education of teachers included

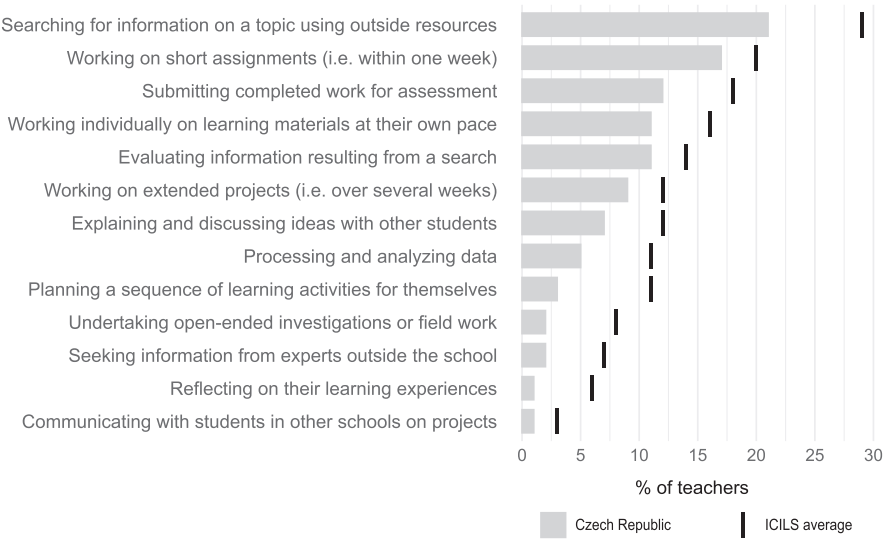

Fig. 3.3 Percentages of teachers often using ICT for the following learning activities in classrooms. (Adapted from Fraillon et al. (2014))

courses focused on innovative teaching methods, such as the use of e-portfolios, and various online tools are used in this type of teacher support (Hrtoňová et al., 2015).

Digital technologies are most often used in teaching computer science. The interviews with students allowed us to peek into the contents of this subject and the way it is taught in in more detail. Jiri described his previous experience with the subject computer science: "According to the curriculum, we are supposed to start the first year with a general introduction to computers, which is what we did last year. We had regular theory, as in when the first computer was built and what it was used for, and the development of computers up to now. We kind of went over it and then we started focusing on the most important programs, so Word, PowerPoint, some works with graphics, and there would be some programming, but only later and it would be much shorter. So that's what we are not doing any more." Jiri's experience typified the experiences of other respondents as well. It shows that education often includes theory or a general introduction into the computer science as a field. However, the main emphasis is being put on the basic trinity of MS Office programs: Word, Excel, and PowerPoint, the mastery of which is considered important and useful by teachers and students alike. Jiri described how their teacher emphasized a detailed showing of all the functions of these programs: "(…) that we've, you know, gone through everything there is. That the teacher is trying to, well she is quite strict, but she is trying to show us virtually everything you can do in these programs." Jiri added that he considered these skills important and useful: "(…) definitely the work with Excel, Word, PowerPoint is quite important now, I think, and it will be useful for sure."

Apart from the general or theoretical topics and the use of basic office programs, the respondents also mentioned working with graphic programs (working with Gimp, editing photographs, etc.) or learning programming (using Scratch, a visual programming language designed for creating animations or simple games). Thus it is clear that in some cases, the teachers of computer science try to develop other fields and skills above the framework of the basic use of the office software. On the other hand, the respondents' answers suggested that these attempts are not always met with understanding. It seems that the teaching is not always performed in such a way as to clearly show the students the usefulness or practical usability of the tools they are being acquainted with. Matej described an interesting experience with teaching focused on Gimp: "Well, in information and communication technologies we are working with the program called Gimp, which is used in photo editing. It could be interesting if I only knew how to use it in my free time, but there are so many complicated functions that I do not know and it rather bothers me. The teacher tells us what to do and we do it basically according to his instructions and maybe two weeks later I don't know what I did before, so I won't use it that much on my own." This shows that the lesson is led by a teacher who presents the possibilities of the program, but there is probably no connection to a practical use or task in which the students could use the acquired abilities and skills for their own purposes. That can lead to a lack of understanding or interest from the students: "First, I did not understand it very well and second, it was kind of boring" (Alice). On the other hand, if the teacher manages to illustrate the use of the given program on an interesting or a practical case, the students can consider the lesson interesting: "We worked in Gimp and we edited bad quality black and white photos, so we tried to change their colors so they would be a bit clearer. It was quite interesting." (Matej).

Apart from the use of digital technologies in computer science, the respondents mentioned the use of technologies in foreign language class. This use case is connected primarily to the use of online dictionaries or translators that the students access using their own smartphones. "(…) in foreign languages, we have German with a German teacher, so that is where we definitely use the translator. It's allowed in English, well it's not like we are waving the phone in her face, but she doesn't mind if we check a word, she's okay with it." (Jiri). It is also not uncommon for the teachers to have some online tests or exercises prepared and to do these with students in the course of a lesson. This situation was described by Renata in connection to English classes: "Recently, we've been going to work on the computers in English lessons quite often. (…) We are doing various tasks that have been prepared in the computers, we have a link to the Internet and that is where we practice. We've been doing it almost every hour recently." The beginning of Renata's statement is worth noticing, because it confirms the situation in which computers are available primarily in computer labs in Czech schools. If an English teacher wants to use various online exercises or tests in their lessons, they have to take into consideration that the entire lesson has to be moved to a computer lab. Therefore, instead of a fluent inclusion of digital technologies into the course of a lesson, there is the phenomenon of "going to work on the computers" in a specialized lab.

This is not limited to language classes. Similar situations occur in subjects other than computer science as well (i.e. subjects that are not regularly taught in a computer lab). The interview with Petra illustrated the use of online exercises and testing on computers in a computer lab within a geography lesson: "We had geography recently and we had it in the information technologies [in the computer lab – author's note] and we wrote a test and we wrote it on the computer. Well, it was, as we have that school site on the Internet, the teacher put up a test there. And we would click on it and it would be timed, ten or fifteen minutes." The use of digital technologies occurs only when the lesson is moved into a specialized computer lab. Among Czech teachers, the use of computers for testing purposes is a long-term type of digital technology-based teaching activities. In our previous research assessing the teachers of a single Czech region (Zounek & Šeďová, 2009), testing represented one of the most frequent uses of ICT (mostly computers) in teaching. Apart from tests or exercises, digital technologies are being used to search for specific information. Jiri described his experience with a history lesson, within which the student activity was necessary, but the teaching was fully led by the teacher. "Then it's history class, she will put terms up on the board and tell us to look them up. If we cannot find something, she has her own curriculum, the history teacher, so she knows what she wants us to find."

The examples from interviews with our respondents can be perceived as a certain illustration of the use of ICT in Czech schools, which we have drawn with the overview of results of qualitative studies. First and foremost, the interviews show that according to our respondents, the use of digital technologies within education truly takes place primarily in the computer labs. Renata stated: "we have been going to work on the computers in English," meaning physically going to a computer lab with classic desktop computers. Apart from using computers in computer labs, students can use their own smartphones in certain situations, primarily for the purpose of searching for specific information, such as the meaning of a term or the translation of a word. Therefore, this kind of ICT use represents a partial complement of teaching. The students can use a laptop only as an exception, usually only on the basis of a specific request, as illustrated in Sect. 3.2. The respondents also spoke about the use of online tools, especially for the purpose of exercises or tests. By contrast, they did not speak very often about the use of LMS or virtual learning environment (VLE) complex education systems. Only Petra spoke in detail about the use of LMS Moodle, and she did so in the context of history classes: "It was our class teacher, who teaches history, she allowed us to use smartphones because of this site, that we can open the history lesson there, the folders, and we can actually have that instead of a notebook. Well, I think… Well, it's not bad, it is actually good that I don't have to write everything down in the lesson, because history is quite extensive and one can't write everything down in the lesson. But the disadvantage is that I have a hard time learning from notes printed on a paper, or those on the Internet… And it's not easy to study from it." Nevertheless, from Petra's viewpoint, the use of the LMS system is double-edged. She appreciated the availability of study materials, but at the same time, she said that it was hard for her to study from pre-prepared materials. The respondent herself had a possible explanation, saying

"It is all very abridged in comparison to writing from dictation," a method that was rather unsuitable for her. One can assume that Petra was more used to the teacher explaining the subject matter and dictating the notes and students writing in their notebooks. Her statement also leads to considerations concerning the important or irreplaceable role of the teacher and their work with digital materials online, when it is not enough to just make the materials available to the students; it is necessary to work with the materials as well. It would clearly be good to have feedback from the students concerning their perception of this learning support.

In addition to the examples outlining how and in what subjects digital technologies are used in schools, it is necessary to monitor how the students themselves see the ways digital technologies are used in teaching. The data from interviews with students suggest that student perceptions are based primarily on the uses that they encounter in their own education, and they usually approach the evaluation of the given use of digital technologies in education in terms of its frequency, meaning whether they are satisfied with the current rate of use or if they would rather have the given ICT-based activity in education more frequently. In some cases, a certain use appeals to them in one subject and they would appreciate a similar use in other subjects as well. It was unusual for students to suggest their own ideas on the use of digital technologies in education beyond the uses they encountered in their school.

Based on the data from the ICILS research, Czech teachers use digital technologies in their teaching at a rate very much below the average rate of other countries participating in the ICILS research. Our respondents often made statements corresponding with this fact. Jiri commented on the frequency of use of ICT by teachers: "Well, it's kind of, really not a lot of time. I don't know, in geography … We have these regular lessons, in which the teachers use presentations, uhmmm, but there's not a lot of it … Practically, like, four hours every week, six hours including computer science, that's eight hours out of our thirty-five or so…" It is clear that in comparison to the total hours of lessons taught, Jiri saw the frequency of the use of digital technologies in his education as very low. In some cases, our respondents did not "intuitively" consider the passive use of digital technologies, such as when a teacher showed them a presentation and they made notes, to be an example of use of digital technologies in education. Only during the course of the interview did they realize that this also represents teaching with ICT.

The topic of presentations, which was mentioned in the interviews by virtually all respondents, appeared in the statement from the interview with Jiri. It is usually such a case of digital technology use where the teachers prepare their presentation in advance (typically in PowerPoint) that they then use in their lectures to present new subject matter using a computer and an overhead projector or an interactive board. This is in fact a transmission of knowledge from the teacher to students, especially when the teacher shows a presentation on the computer during their lecture and the students have to take notes. However, our respondents do not automatically condemn such a use of digital technologies, specifically presentations. On the contrary, sometimes they would appreciate these digital technologies being used in subjects in which their rate of use is lower. "Yeah, because some of this stuff would really, they would really be useful, if it was prepared in this way. In history lessons,

I would like to have presentations on top of it all" (Jiri). This statement suggests that presentations can be a useful teaching aid. Renata explained it in even more detail: "I think that if the teachers leave it to us, to make the notes ourselves, that it is harder to understand in comparison to a prepared presentation. So I think there should be more of them."

There are situations in which the students themselves create presentations and show them to their classmates. An example of such a use of presentations in teaching was described by Alice, who prepared a presentation in PowerPoint at home and then presented the topic to the entire class using an interactive board:

R: (…) when we do some presentations, we then show them on the board.
Q: And you have to prepare them at home, right?
R: Yep.
Q: And in what program, or how do you create these presentations?
R: Well, PowerPoint.

This is an example of student activities with digital technologies in which the students learn the given topic, learn to use a certain program to create the presentation, and stand in front of the class to present and explain the topic. The teacher is thus more of an assistant or advisor who manages the events in the classroom but is not the main source of information on the given topic. Alice added that sometimes the students are assigned a topic that they have to research themselves and then present the results of their research on an interactive board in front of their classmates, and they have to create the presentation on school computers during lessons rather than at home.

R: We did presentations on various, what do you call it, for example I had a presentation on
Facebook. About networks, places.
Q: Each of you received a topic…
R: Yep.
Q: Then you went to a computer and you could prepare it there.
R: Yep. (Alice).

This is a form of project-based learning that uses digital technologies in various phases of the project including the presentation of results.

Some respondents spoke of ways other than presentations to integrate ICT into teaching. Some teachers use videos from YouTube or other online services in the course of their lectures, which is appreciated by the students. Alice noted: "The teacher plays some videos from Stream [Czech video platform – authors' note] for us, some historical videos in history class, and that's cool." Some teachers also include various types of interactive exercise applications such as Quizlet or Kahoot! that the students find entertaining and thus would appreciate a larger integration. Renata told us: "I like it when there's a new application, for example, we have Kahoot! in school and these are like quizzes from the subject matter we went through and it's quite fun, so we could be doing that more." The interactive board available in the classroom can also be used in some forms of exercises. Renata

described how the teachers used to use interactive boards in lectures in earlier grades, even though she believes that it would be suitable to use them more even now: "Especially earlier, when we were younger, we used to exercise a lot on those various interactives and you know, exercises and in front of the class and all. They sent us to work on a problem on the board and the entire class could see it. And if somebody made a mistake, it got explained right away. I think we could do that more."

Our respondents did not mention (more extensive) school projects utilizing ICT. Matej provided us with a certain explanation: "We do have such lessons, but only as an exception. If we have a project, then we can turn on the Internet if four people are working together on a paper, some lessons are reserved for this and we can work on the paper in these. But that happens very rarely." However, this type of teaching includes features of team cooperation and collaborative problem resolution using ICT. The use of student phones is also mentioned; this is not only faster and easier for the students, but it is also advantageous for the teacher who does not have to move the entire lesson into the computer lab and thus lose teaching time. In addition, in the activities of this type, the controlling role of the teacher is also pushed back and the activity of the students themselves becomes a priority.

Very interestingly, despite the very limited use of laptops in school, some respondents spoke about options or ideas for including these devices at least partially in their studies. "Now, because there are a lot of notes, such as practical lessons in biology [education in a lab, performing experiments and processing reports on the course of the experiments etc. – authors' note]. We constantly reuse tools and the procedures are always almost the same. I can imagine that if we did it on the computer, it would just be a matter of copy and paste. And that is a lot of time saved. And that is the case in many subjects, that for me, it is easier to write on the computer. If I have to keep writing the notes, this would be definitely better for me, you know" (Jiri).

3.4 Teachers' Skills and Abilities in the Use of Digital Technologies

In this section, we focus on the teachers' abilities in the use of digital technologies in their teaching. Figure 3.4 illustrates how well Czech teachers, by their own assessment, can handle selected activities or tasks on the computer. The data are from the ICILS 2013 research and the figure displays the average level across the countries besides the Czech Republic that participated in the ICILS research. This figure clearly shows that teachers tend to trust their own skills in the use of a computer. More than three quarters of teachers said that they were able to do eight of out of the fourteen set activities or tasks. For Czech teachers, the top ranks are occupied by activities such as *finding useful teaching resources on the Internet*, *producing a letter using a word-processing program*, *e-mailing a file as an attachment* and *filing*

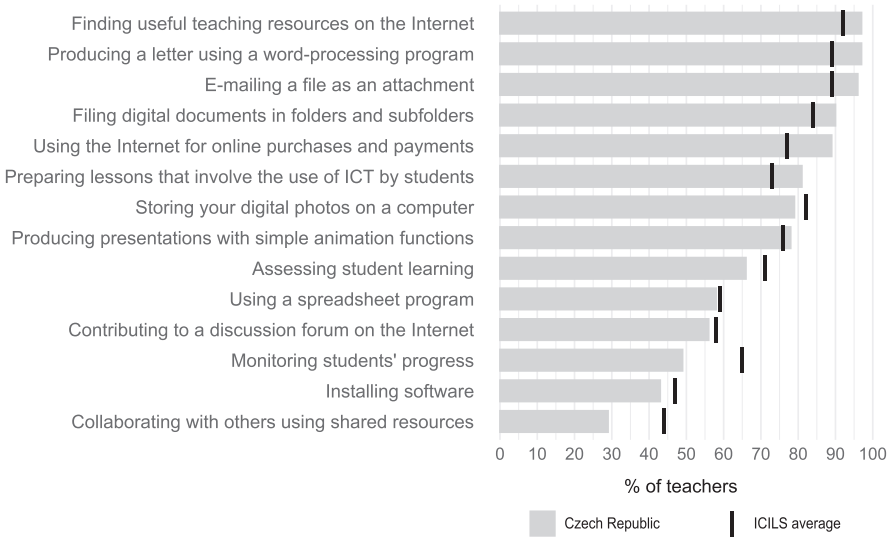

Fig. 3.4 Percentages of teachers expressing confidence in performing different tasks on a computer. (Adapted from Fraillon et al. (2014))

digital documents in folders and subfolders. More than 90% of teachers stated that they could handle these activities. The other side of the spectrum shows activities such as *monitoring student progress*, *installing software*, and *collaborating with others using shared resources*; less than half of the Czech teachers stated that they could handle these activities on a computer.

The aforementioned figure also clearly shows some differences between the Czech teachers and the ICILS average in the perception of one's own skills and abilities in the use of digital technologies. In the basic abilities such as finding useful information or materials on the Internet, writing a letter using a text editor, and sending a file via e-mail as an attachment, in the Czech Republic, statically more teachers expressed their trust in their abilities than the average. On the other hand, for activities such as installing software, saving digital photos in the computer, and using shared documents, there were statistically significantly fewer teachers in the Czech Republic who stated that they could handle these activities.

The focus on activities and tasks directly related to teaching (specifically: *preparing lessons that involve the use of ICT by students*, *assessing student learning*, and *monitoring student progress*) can uncover interesting information. While in preparing lessons, Czech teachers statistically significantly exceed the ICILS average, Czech teachers are statistically significantly worse than the ICILS average in monitoring and evaluating students. Thus it seems that Czech teachers handle digital technologies relatively well, or they believe that they do, only in the primary aspect of teaching, i.e. preparation. However, as regards other aspects of teaching such as student evaluation, the ability of Czech teachers to use digital technologies is comparatively rather worse.

Similar results were provided by the *Survey of Schools* (European Commission, 2013) research, according to which European teachers most often use ICT to seek information in the course of preparing for teaching, for preparing homework for students or for presentations, and for creating "collections" of online sources for use in lessons. Creating digital sources, which is more frequent than evaluating digital sources, is another rather frequent activity of European teachers. A very small percentage of European countries use digital networks and their services in their work. For example, they rarely use school websites or virtual learning environments, they do not set homework or give feedback to students over the net, and they communicate with parents infrequently (European Commission, 2013). In general, teachers declared larger assurance in the use of "operating ICT skills" than in skills related to the control and use of social media or tools for sharing and cooperation. At the same time, it is clear that teachers feel more confident with tools that can be used to support traditional education rather than within project-based learning or learning based on student cooperation or communication.

It is not very surprising that within the TALIS 2013 research (Kašparová et al., 2014), Czech teachers mentioned the need for further education in the field of development of pedagogical skills in the ICT use as one of the most important. The need for further education with ICT clearly persists, because in the TALIS 2018 research (Boudová et al., 2019), the use of ICT in teaching was among the fields in which Czech teachers felt the least prepared for teaching. One explanation for this may be that the ratio of Czech teachers mentioning the use of ICT in teaching as part of their formal education is below average in comparison with the EU (the Czech Republic 45%, EU average 53%).

Rather interestingly, Czech teachers feel a quite significant need to educate themselves in the use of digital technologies in their workplace (Kašparová et al., 2014). It is clear that digital technologies develop and change very quickly, so the need for continuous education is justified. The report on the need for further education in the use of digital technologies in the workplace, that is, in the schools, should also be kept in mind. This can concern not only administration, but also communication with various subjects outside of school (parents, experts, etc.) and the use of these out-of-school resources in teaching. This is related to the matter of adequate digital technology tools.

During the interviews, our respondents also spoke about the teachers' skills and abilities in the use of digital education in education. However, the students did not evaluate teachers' abilities often, and when they did, they made very general or varying evaluations. Jiri spoke about the skills and abilities of teachers in the use of ICT to a greater extent: "Well all of them can definitely make a presentation. I have seen all of them do that. ... Really, most of the teachers can do it. And I would say that there are very few teachers who can't do anything or can do only the very basics. And then there are the IT teachers, who can work with it almost perfectly, so I think that an absolute majority of them really knows how to use it. (…) Well I think that for their job, it is absolutely sufficient." Jiri's statement illustrated the view of almost all of the respondents concerning the teachers' skills in the use of digital technology. Generally, respondents tended to evaluate the teachers' skills rather

positively, i.e. that most teachers had the sufficient skills and knowledge for teaching. According to the respondents, it was rather rare to encounter teachers who were not able to work with digital technologies at all. On the contrary, the students evaluated the skills of computer science teachers very highly. Jiri stated: "Well, most IT teachers manage those websites, so let's start there, that they are positively active on the Internet. Which is what the regular teachers probably can't do." Apart from the evaluation of abilities itself, the respondents stated that in their schools, in addition to teaching their subject, computer science teachers are responsible for things like managing the school website and other online systems used within schools.

In the descriptions of the abilities of regular teachers (i.e. other than the computer science teachers), the topic of presentations surfaced regularly. Jiri stated: "(…) most teachers can definitely do these basic things with presentations." On the other hand, Renata also noticed some problems connected to the creation and use of presentations by teachers. "When I look at their presentations, it's kinda not like they have it worked out very well. They, the teachers, they write is exactly as it sounds in their heads, that's how they write it. And they don't have anything from the Internet, images, nothing there, really just a regular presentation." Here, Renata did not evaluate the teaching supported by the presentation, but the form and the content of the presentations themselves; her view includes specific weak points of the presentations. It seems that the teachers' presentations often are just text presentations of the content of the curriculum that the students are supposed to write down or learn. However, with such an approach, the use of the presentation format largely loses its purpose, i.e. to support the presenter's lecture.

Possible technical deficiencies or difficulties in teaching are something the students notice and they evaluate their teachers' abilities on that basis. Jiri mentioned: "(…) it's funny when you laugh at teacher who has few minutes difficulties with turning the speakers on the PC on and then they are looking for the proper button on the screen and then invite someone who knows what they're doing and they just turn it on and leave." Matej also mentioned situations in which the teacher had to be helped with the digital technology by the students or the requested computer science teacher: "There are some teachers and if the sound does not work, someone from the class will help them. Or if there is an issue, my classmates always try to get in on it and solve it. Then we call the informatician, he will deal with it." Other examples include the difficulties and simultaneously the inadequate competencies of the teachers in searching for information or teaching sources on the Internet. Jiri added: "It is kind of like when they search for images on Google and they write like… they write the entire question in the Google search bar…not only the key words".

At the same time, the respondents realized that knowledge and abilities in the use of ICT may not always be connected to the teacher's age. Petra mentioned the use of smartphones by older teachers, which initially surprised her. "Also, when I got to the school, I was quite surprised that even older teachers, the teachers who I wouldn't believe would have such a phone, just use and work with them completely regularly." On the other hand, Jiri mentioned an example of a rather young teacher, who was not very competent in the use of digital technology in his opinion. "The class

teacher, who is not that old, can't do a lot on the computer. Well, you can say that she can't, but it is really not that necessary for teaching." The second sentence, in which Jiri says that these technical abilities are in fact not that necessary for teaching, is notable. It seems that if a teacher prepares lessons without any or with minimum use of digital technologies, the students will recognize certain gaps in teachers' abilities in this field, but at the same time, they don't see it as a negative or a serious problem.

3.5 Teachers' Approach to Digital Technologies

The last field we focused on in the analysis was the teachers' approach to the use of ICT in education and teaching of students, and we did so with regard to what student competences and abilities related to the use of digital technology were considered important by teachers, and in connection to how teachers perceive the opportunities, or, on the contrary, the challenges connected to the use of digital technologies in the school environment.

Figure 3.5 depicts the percentage representation of teachers who put strong or at least some emphasis on the development of the selected skills and abilities while working with ICT. The figure clearly shows that most teachers (64% in the Czech Republic, 63% in the average of the ICILS research) emphasize the ability to effectively work with information. Other areas usually range about 50% (i.e. about half of the teachers emphasize them); in a number of cases, there is not a significant

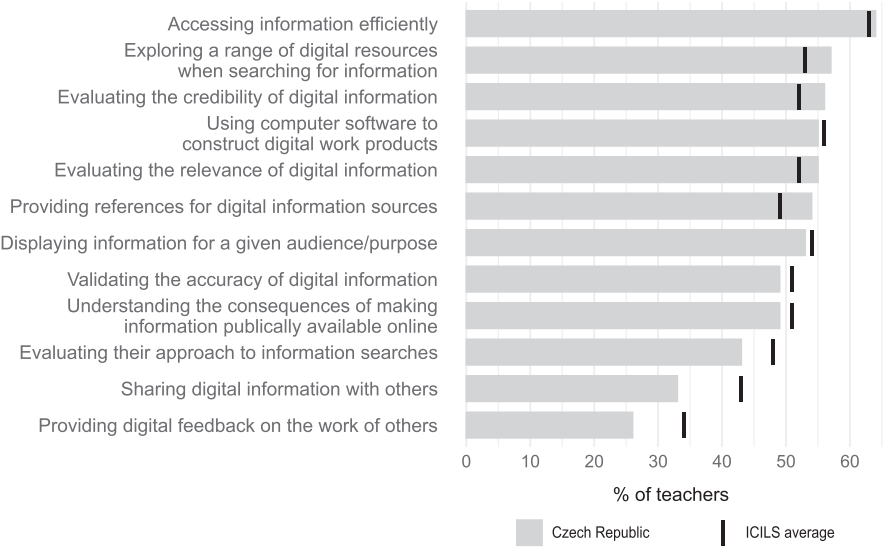

Fig. 3.5 Percentages of teachers placing strong emphasis or some emphasis on developing the following ICT-based capabilities in their students. (Adapted from Fraillon et al. (2014))

difference between the teachers in the Czech Republic and the ICILS average. Nevertheless, a certain tendency is visible here. Czech teachers place statistically significantly higher emphasis on the development of student abilities in the following fields: exploring a range of digital resources when searching for information, evaluating the credibility of digital information, and providing references for digital information sources. Thus it seems that Czech teachers place greater emphasis on the students being able to find information, to evaluate the information's credibility, and to properly cite the sources used. In contrast to the ICILS research average, Czech teachers place significantly less emphasis on the student ability to evaluate their approach to search for information and to communication and cooperation (specifically, sharing digital information with others and providing digital feedback to the work of others). In conclusion, it seems that Czech teachers focus on the development of such abilities that the students can develop individually, regardless of other students. By contrast, much less attention is paid to skills based on communication and cooperation in a team or a larger group of people. Incidentally, this also complies with other results in which the use of ICT to support communication, cooperation, or problem solving plays a rather minor role.

As regards the perceived benefits or risks connected to the use of ICT in education, Czech teachers more or less agreed with the ICILS average in two basic benefits of digital technologies. According to 97% of teachers (96% in the ICILS average), digital technologies enable students to access better sources of information. According to 92% of teachers (91% in the ICILS average), digital technologies help students to consolidate and process information more effectively (see Fig. 3.6).

In the other evaluated fields, Czech teachers statistically significantly differ from the ICILS research average. A clear trend is visible in which the Czech teachers tend to more frequently agree with items focused on the risks or negative phenomena connected to the use of digital technologies in education. In comparison to the ICILS average, Czech teachers agree less often with items that concern the benefits of digital technologies in student learning. To a larger extent, Czech teachers are convinced that digital technology only distracts students from learning (28% in comparison to 24% in the ICILS average) and that the use of digital technologies results in poorer writing skills among students (75% in comparison to 67% in the ICILS average). Czech teachers also agree significantly less with the use of digital technologies leading to better student academic performance (53% in comparison to 68% in the ICILS average). On the other hand, the result concerning mathematical abilities is rather surprising. In this case, Czech teachers agree with the statement that ICT results in poorer calculation and estimation skills among students to a lesser extent. The difference between the ICILS average (48%) and the Czech teachers (46%) is rather minor.

Czech teachers are also much more skeptical of the potential benefits of digital technologies in the contexts of communication, cooperation, and planning. Only 58% of Czech teachers agree with the statement that use of ICT enables students to communicate more effectively with others (68% in the ICILS average); 62% of them agree that the use of ICT helps students learn to collaborate with other students (78% in ICILS), and 41% agree that the use of ICT helps students develop

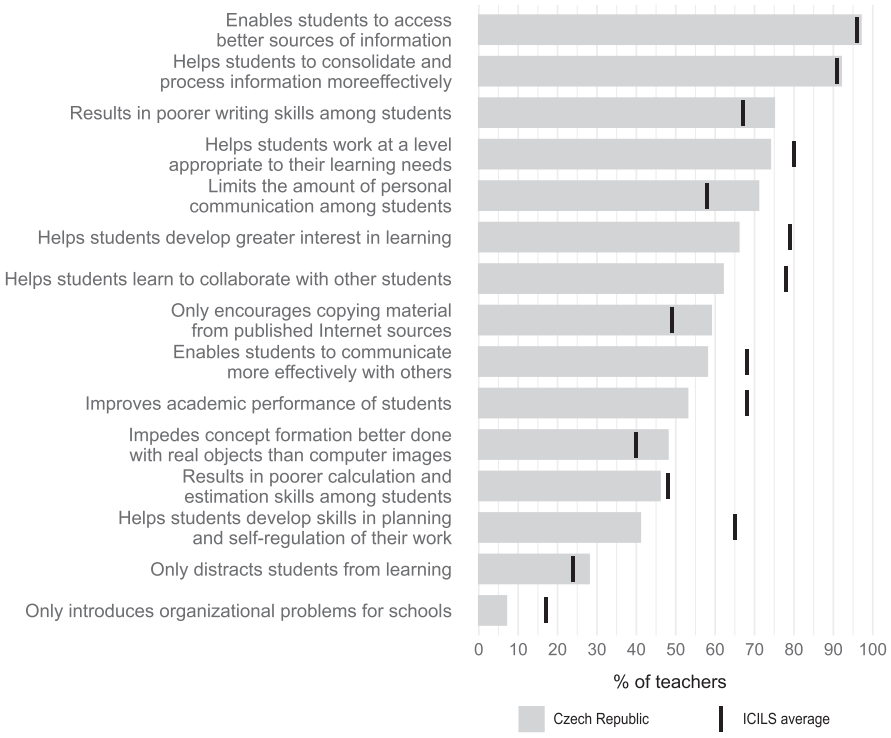

Fig. 3.6 Percentages of teachers agreeing with the following statements about using ICT in teaching and learning at school. (Adapted from Fraillon et al. (2014))

skills in planning and self-regulation of their work (65%). Czech teachers perceive the risk of limiting the amount of personal communication between students in connection to the use of digital technologies as more significant (71% in comparison to 58% in the ICILS average). This is in agreement with the previously published results that suggested that Czech teachers do not use technologies focused on communication and cooperation in their teaching and do not perceive the development of abilities in these fields as very important.

In the remaining fields, Czech teachers are significantly more skeptical than the ICILS average. Czech teachers are much more frequently convinced that the use of ICT only encourages copying material from published Internet sources (59% in comparison to 49% in the ICILS average) and impedes concept formation better done with real objects than computer images (48% in comparison to 40% in the ICILS average). They agree significantly less frequently with the statement that the use of digital technologies in education helps students work at a level appropriate to their learning needs (74% in comparison to 80% in the ICILS average) or that it helps students develop greater interest in learning (66% in comparison to 79% in the ICILS average).

Thus it is clear that Czech teachers are generally more critical of the use of ICT and put more emphasis on the potential negatives. This applies to limitations of direct personal communication between students, support of mere copying of materials from online sources, and the digital technology's potential to distract the students or draw their attention away from learning, as was also mentioned in our previous research (Zounek & Šeďová, 2009). The analyses by Eickelmann and Vennemann (2017) showed a rather strong skepticism of Czech teachers, since more than half of the Czech teachers participating in the ICILS research were in the groups of "partial doubters" or "absolute doubters." The second group in particular practically refuses to use ICT in school and at best it admits that digital technologies allow students better access to information sources. German and Norwegian teachers were much less skeptical in this field. Eickelmann and Vennemann (2017) pointed out a rather interesting paradox: even though the Czech teachers were rather skeptical toward digital technologies in education, their students were among the best in the ICILS 2013 research (Eickelmann & Vennemann, 2017). A possible explanation is found in the national report from the ICILS 2013 research (Basl et al., 2015), which focused on the strong and weak points of Czech students in the computer and information literacy test. Czech students had no problems with the general use of digital technologies or with simple tasks connected to software use. For a more complex task, in which the students had to adapt the provided information (i.e. to rephrase it in their own words) for a certain audience, only 9% of Czech students passed. Czech students also had great room for improvement in the ability to verify the credibility of information and information sources (Basl et al., 2015). With a certain degree of simplification, it can be said that Czech students excel in the use of digital technologies and software and they are aware of the risks connected to the ICT use, but many students are unable to perform more advanced work with information in digital form. These results could be explained by the teachers' approaches and concepts of their teaching, in which the use of digital technologies is rather limited.

Our respondents suggested that teachers primarily emphasize the students' ability to effectively acquire information using digital technologies in their teaching. Jiri stated: "In school, it's mostly for searching, because a couple of teachers already use these things, so they will let us pull out a phone in class and find something." However, Jiri's statement concerned a small group of teachers ("a couple of"), who include this type of use of digital technologies in their teaching. This confirms the results of the ICILS research, according to which Czech teachers use almost all types of digital technologies less frequently than the average of other countries within the ICILS research.

Different approaches of teachers toward the use of digital technologies in teaching can be deduced from the interviews with respondents. This topic appeared especially in connection with the student use of smartphones, both directly in class during lessons and during school breaks or in school in general. Matej stated the following about the use of smartphones: "Some teachers object to the students using the phones, so they can make it so the phones cannot be used, others don't mind it if it does not interfere with the lesson, some don't even notice, it depends on the

teacher." Alice added: "The teachers don't care, but a lot of my classmates have their phones on their desks and they're doing something on them the entire lesson." Another teacher approach to mobile technologies was described by Renata: "At the moment, the phones are forbidden in lessons, they have to be hidden, so that's a really strict rule, but it's not like we cannot use them during the school breaks. ...So it depends. The older teachers don't like seeing it, you know." Thus it is clear that teachers' approaches vary widely in this context, ranging from very liberal to completely restrictive. What Matej mentioned at the beginning is also significant: this matter is something the teacher must be able to "have arranged," i.e. it is up to the teacher in what way they approach the lesson or set up the rules for the use of smartphones by students in lessons.[9]

However, the students themselves realized the potential negatives of the use of mobile phones in lessons. On the basis of this awareness, they are capable of regulating their own behavior. Alice commented: "I usually have my phone in my desk, so that no one could take it, and I don't check it a lot during the lesson, I'd rather listen to what the teacher says so I get something from the lesson. If I kept checking my phone, I would learn almost nothing." Alice thus saw the phone as a distraction, especially because she would look at things not related to the lesson on the phone. She intentionally keeps her phone in the desk to stay focused on the teacher's presentation. Renata spoke similarly on this topic: "I have a friend, she's always using the phone during lessons, always during school breaks, then she does not know the subject matter and at the end of a lesson, she tells the teacher that she does not understand. And I told her not to be on the phone in lessons and to listen. And she tells me that she can both listen to the teacher and check the phone, but I think that she cannot handle both." Both statements suggest that the students can see the smartphone as a distraction. At the same time, these are probably examples of teaching in which the teacher's lecture dominates and the use of digital technologies (or a smartphone) does not play any explicit teaching role. Therefore, it is understandable that in such a situation, smartphones can primarily divert attention from the teacher's lecture and thus be perceived even by the students themselves as a distraction. On the other hand, the smartphone can also serve as a tool to "stave off boredom." Jiri stated: "When I am really bored, I browse for stuff, but that only happens rarely. There are moments when you don't have to pay attention, but there are also subjects in which you have to pay attention to what is going on." Self-regulation and teaching concepts play a role here. At one time, a smartphone is a barrier to learning, because it represents a distraction; another time, it is a tool for utilizing the time in class that the students see as boring or not valuable.

In some interviews, we discussed the topic of the excessive use of mobile technologies and the associated bad habits. It is clear that at least some students reflected upon this topic and realized the various dangers that the extreme use of smartphones could bring. Renata shared the teachers' fears regarding the decrease of direct

[9] The latest amendment to Education Act No.: 561/2004 Sb from 2020 allows schools to limit or to forbid the use of mobile phones or other electronic devices by students.

communication between people as a result of the excessive use of smartphones: “On one hand, there’s the thing that people don’t meet any more and just text each other all the time and in that way, are growing apart and no one actually has any relationships other than the relationships over technologies…In those kids, you can see that the lesson ends and the first thing they do is grab their phones and just sit, don’t communicate with each other and they are just on the phones.” Petra expressed a similar opinion: “Well the disadvantages include also, well you can get, I am not like addicted to it, but the addiction can develop, that some friends really cannot be without the phone and perhaps that it also really distracts from the learning and so on.” Renata then added an important piece of information, explaining why she believes that some teachers intentionally do not use their own mobile phones during lessons. “Well, they (the teachers) are kind of, they believe that it really controls these kids a lot. That they shouldn’t have it, that it affects them in everything, in hyperactivity and so on. So they try not to use it in front of them.”

The students described rather dissimilar teachers’ approaches to mobile phones in the classroom during lessons. The students in our research were not unambiguously for the liberal approach and against the limitations of the use of digital technologies during lessons. They themselves realized the possible negative consequences of the excessive use or time spent using smartphones in school. The question remains of the extent to which these opinions are formed by the very teachers’ approaches or their generally lower use rate of smartphones (or generally digital technologies) in school and the extent to which these are independently formed adolescent opinions coming primarily from a conscious reflection of their own experience in the use of smartphones or digital technologies in general.

3.6 Conclusion

Digital technologies have become a part of life of both Czech schools and teachers’ work; they do not represent a completely new element of their work that should surprise or startle them. In connection with our results, the mere presence of digital technologies in schools, even long-term, does not automatically lead to a transformation of education, to learning, or to improved student results. In addition, the infrastructural problems are still relevant. The school equipment keeps improving, but a new problem has arisen: the aging of the infrastructure and especially the administration of digital technologies in schools. Mobile technologies and the issue of the security of their first-rate and safe connection represent new challenges. These could bring about at least a simpler use of various programs and applications in all classrooms, and they would be available at any time.

It is becoming clear that computer labs have rather one-sided and limited use – almost exclusively for computer science classes. They are less available for other subjects. Paradoxically, they can become a barrier for the use of digital technologies in school because the teachers can give up on using them due to the limited access and to the complicated organization within the school (booking the lab, moving the

students). Preparation for such lessons can also be more difficult because the teachers cannot prepare their lesson directly in the given classroom or try out the applications or programs. Teaching in a computer lab can then seem like something special or a mere addition to the regular lessons to the teachers and in the end even to the students. The digital technologies are thus not a common part of classrooms and the study environment, in which ICT could be used at any given moment, with or without a plan. Use of mobile technologies is an option, but their availability in schools is limited, and sometimes there is insufficient infrastructure for the connection of the entire class at the same time and for the use of more demanding applications or audiovisual materials. Some teachers use digital technologies and sometimes they also ask the students to use their own mobile devices. However, these represents exceptions to the rule.

The equipment is just one side of the coin. The other side is the didactic use of the existing digital technologies by teachers in lessons. This is a much more complicated and complex challenge than the infrastructure. The teachers' opinions and beliefs are much more difficult and time-consuming to change than the development of digital technologies themselves. Czech teachers have been "living with digital technologies" for a rather long time now; despite this, our results (and even the results of older studies) show that ICT are still being used in a rather limited manner and usually just to support traditional approaches to education. This concerns the predominant teacher-centered approach, the use of digital technologies for a transmissive style of education (presentations), and the preference of work with information. This alone is not necessarily wrong, because digital technologies can significantly support the plasticity of the subject matter and support the lecture or explanation by the teacher. Perhaps in some cases, this is the best possible approach with regard to the quality of the available infrastructure at the given school. In addition, the students themselves appreciate it when a very well-crafted presentation is used functionally. However, some teachers use various online services or tools in lessons to support their lectures or to make study materials available to students in electronic form. Thus there are certain steps from the traditional education toward a twenty-first century education.

The suggested ambivalent relationship between digital technologies and teachers is clear in other contexts as well. The field of education and the further education of teachers is one example. For fifteen years, Czech teachers have been able to use various forms of training and support in relation to both the instrumental abilities of ICT use and the didactic use of digital technologies in education, and rather advanced online digital technologies are being used in some courses. Nevertheless, they keep using only a limited amount of digital technologies in the long term, especially for preparing lectures, for acquiring information for lectures, and for presenting information to students. In addition, teachers constantly declare the need to educate themselves in the use of digital technologies in education. The available support thus probably does not address the teachers' needs in the given field and perhaps it is only oriented on the use of digital technologies in traditional education. Perhaps the education of teachers is a key to transforming education into twenty-first century education. However, the attention in the field of teacher education has

to be focused not only on the use of digital technologies as such, but also on the preparation of teachers for the use of digital technologies in the context of the new models of education, including an explanation of the transformations in the goals and contents of teaching.

The necessity of a systemic approach to the transformation in education is clearly visible. The digital technologies must be understood as a part of educational innovation with many aspects or layers. Even though we see teachers as key agents of change and as the people who implement ICT into the actual education, the teachers themselves cannot achieve any changes without previous changes on the level of schools, curricula, and education policy. In the Czech Republic, it is not a vision of educational innovation that is missing, but rather its fulfilment. Accomplishing pedagogical innovations in the schools themselves is especially difficult.

With some caution, the results of quantitative studies can be generalized to the entire population of teachers and to all schools in the Czech Republic. With student-focused qualitative research, we can add qualitative studies and emphasize some important moments regarding digital technologies in the life of both teachers and students. Students use digital technologies in education primarily according to the instructions of their teachers, especially considering the predominant teacher-centered approach to the concept of teaching. This was also revealed in some interviews in which the students mentioned that they had to get a teacher's or even principal's permission to be allowed into a computer lab or to use mobile technologies in education. The students have limited options for negotiating the rules of the use of digital technologies directly in lessons, or at least they did not mention any. However, it is also clear that they are aware of the negative aspects of the use of digital technologies in education, such as distraction, and so they often intentionally do not use them. Nevertheless, this does not mean that the students have no ideas about what digital technologies could bring into education Our interviews were often focused on the problems of use of smartphones, which were a very strong topic in the adolescents' lives. This was also reflected in connection to the topic of school education, where it was revealed how much more flexible the mobile technologies can be than computer labs.

The fact that in schools, the students "see" the very limited (and repeatedly mentioned) use of digital technologies by teachers probably also helped to form a rather ambivalent relationship between the teachers and the digital technologies. In the interviews, we did not register many mentions of ICT being used in long-term or more difficult projects. In addition, the respondents only rarely mentioned any use of online services or social networks. It is necessary to understand that the students lack experience with more advanced use of ICT in schools, and they also do not have a very good idea of what more advanced use of digital technologies could look like, such as in cooperation in a team or in various creative activities. We barely spoke with the respondents about the use of digital games in education, although this does not mean that they are not used in other schools. We registered in some interviews that the students use some applications even outside of school. In some cases, the use of a practically oriented application (editing of pictures and photographs) is complicated by the very style of teaching focused on the presentation of

options without a connection to a practical use within any meaningful activity. This leads us to consider the significant emphasis of Czech teachers on the very instrumental concept of teaching in the field of digital technologies. Respondent statements on writing notes or about "a lot stuff in history" represent yet another example of rather traditionally oriented teaching. At the least, this suggests a prevailing orientation on the transfer of content in which digital technologies serve to simplify the transmission of information from the teacher to students.

In conclusion, we return to the paradox noted by Eickelmann and Vennemann (2017) in their research. The paradox concerns the fact that the Czech teachers participating in the ICILS 2013 research were skeptics regarding the use of digital technologies in education and that a rather large group of teachers practically refused to use digital technologies in their teaching. They consider the role of ICT to be positive only in terms of access to information. Nevertheless, their students achieved excellent results in the computer and information literacy test. The results of our research, which provides a more detailed insight into the education in Czech schools, can at least partially explain this paradox. One explanation seems to lie in the setting/methodology of the ICILS 2013 research, in which many items lead to abilities that are taught and favored in Czech schools – i.e. these "instrumental" abilities in the use of digital technologies including the teachers' emphasis on work with information. It is not then surprising that the Czech students were among the best. However, if the task concerned more advanced work with information, the of Czech student scores worsened (see Basl et al., 2015). There is a certain connection to the concept of teaching in Czech schools.

The national report from the ICILS 2013 research (Basl et al., 2015) stated one more important finding, specifically, that "according to their statements, the students have learned a number of issues related to computer and information literacy outside of school" (p. 7). This does not diminish the importance of school in this field, because at the same time, "school is an important support for students both with the lowest and the highest scores" (p. 7). On the other hand, it suggests that it is necessary to overcome the existing pedagogical discourse concerning the use of digital technologies that focuses primarily on the role of digital technologies in teaching and learning in school (comp. Arnseth et al., 2016), and to start paying more attention to the use of digital technologies in the students' lives and in the context of out-of-school environment as well.

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Chapter 4
The Availability and Use of Digital Technologies in Relation to Students' School Performance

Abstract This chapter focuses on how much the availability of digital technologies and their use by present-day Czech adolescents affect student performance in school. Even though digital technologies are a key topic both in current pedagogical research and within regular school practice, there are still many ambiguities about the actual impact of digital technologies and their use on the results of the education of today's students. The goal of this chapter is to describe and explain how the availability and use of digital technologies by students both in and outside of school are reflected in their school performance. Within the analyses, we focus on the availability and the use of digital technologies directly in school and on the availability and the use of digital technologies by students in their home environments. In addition to the use of digital technologies in general, we focus specifically on the frequency of Internet use and we consider other aspects related to the use and the role of digital technologies in adolescents' lives, such as interest in digital technologies and the perceived ability and independence in their use.

In the first part of the chapter, we introduce the topic of the availability and use of digital technologies as a whole and then specify a concrete research question that we ask in this part of the research. We describe the methodology of the performed analyses, including a basic description of the variables used. In the next three subchapters, we gradually present the answers to our three research questions. In the final part, we conclude by summarizing and discussing the results of the performed analyses, and we set them in a wider context.

Keywords Digital technologies · Schools · Home · Students · Competence · Autonomy · School performance · PISA

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4.1 Theoretical Background

Digital technologies are undoubtedly one of the key elements of present-day education in most developed countries. In the Czech Republic, this is clear from the existence of several strategic documents that focus or focused explicitly on the specific problems of digital technologies in education. We present these strategic documents in more detail in Chap. 2, but here we note primarily the *Digital Education Strategy 2020* (Ministry of Education, n.d.), *Digital Literacy Strategy of the Czech Republic for 2015 to 2020* (Ministry of Labour and Social Affairs, 2015) and the *Digital Czech Republic v. 2.0 – The Way to the Digital Economy* concept (Government of the Czech Republic, n.d.). Each of these documents places a clear emphasis on digital technologies becoming an integral part of teaching and the entire education process so that the development of digital literacy and of the competences necessary for functioning and working in contemporary society were guaranteed for the students.

Digital technologies have already entered school life in most schools, and teachers use digital technologies to a greater or lesser extent within their teaching (see Chap. 3) or in dealing with their everyday school agenda (Czech School Inspectorate, 2017). Digital technologies have significantly influenced education in Czech schools for a long time. Nevertheless, there is still much to be learned about the impact of digital technologies on education and on the school system in the Czech Republic. The topic of digital technologies in education has not been sufficiently considered in the Czech Republic, and this is even stated directly in the *Digital Education Strategy* (Ministry of Education, n.d.) in which the insufficient research and monitoring of the implementation of digital technologies into education is listed as one of the fundamental problematic points of this field. Overall, the Czech Republic has long lacked systematic monitoring of the functioning of its education system that would be performed through research or evaluation activities on the national level (see Potužníková et al., 2014; Straková, 2009, 2016). Incidentally, this corresponds with the results of a study by Zounek and Tůma (2014) according to which there were only nine empirical studies focused on the problems of digital technologies in education in the four main Czech scientific pedagogical journals between 1990 and 2012.

Regarding the availability and use of digital technologies in the Czech Republic, it is necessary to consult primarily the studies and research reports by the Czech School Inspectorate (CSI) and the international studies performed in the Czech Republic (primarily ICILS 2013 and PISA 2012, 2015, and 2018). The 2017 CSI topical report (Czech School Inspectorate, 2017) confirms that digital technologies are a completely common part of life in almost all schools in the Czech Republic, since 99% of large primary schools (i.e. those with more than 150 students), secondary schools, and tertiary technical schools use some sort of an information system to maintain the school agenda and operate their school website. According to the report, the level of equipment and use of digital technologies is a bit less in smaller primary and nursery schools, even though approximately 90% of nursery schools and smaller primary schools operate their own website and information system. On

the other hand, the report also mentioned several problems connected to digital technologies in Czech schools. These include primarily the insufficiently staffed ICT administrator positions, which is an official position in only 17.7% of nursery schools and 35.1% of primary schools. The CSI concludes its report with the rather alarming statement that the minimum standards for good and proper use of digital technologies in schools are met by only 5% of small primary schools, less than 10% of large primary schools, and approximately 20% of secondary schools and tertiary technical schools (Czech School Inspectorate, 2017).

The results of the large international studies performed in the Czech Republic also note the more or less universal availability of digital technologies for Czech students. Over 98% of students had a computer at their disposal at home in 2012; only slightly less (97.4%) have Internet access at home (OECD, 2015). In schools, 96% of Czech students have access to a personal computer, portable computer, or a tablet. On the international stage, Czech students generally are among the more frequent users of ICT, both in school and at home in their free time. The amount of time spent online outside of school does not vary significantly in dependence on the socioeconomic status of the students. Nevertheless, there are probably certain differences in how students from families with varying socioeconomic statuses use the digital technologies. For example, students with lower socioeconomic status spend less time acquiring practical information from the Internet or reading news on the Internet than students from families with higher socioeconomic status (Czech School Inspectorate, 2016). There are still certain differences in the availability or use of digital technologies on the basis of socioeconomic status, but by all accounts these differences are not as substantial as they used to be (Basl, 2010; OECD, 2005).

Concerning the use of digital technologies by fifteen-year-old students, the results of the PISA international research focused in part on how much time fifteen-year-old students spend online. The time spent in school and at home on one hand and the time spent on the Internet during the workweek and during the weekend on the other hand were further distinguished. According to the PISA 2012 data, approximately 36% of Czech students spend four or more hours using the Internet during the weekends, an above-average value internationally. A similar situation applies during the workweek, during which the Czech students spend more time online at home than the OECD average. When comparing this to the data from the PISA 2015 research, the amount of time the students spend online seems to be gradually increasing (OECD, 2015, 2017). Regarding the use of the Internet in schools, the available data indicates that Czech students spend less time online in school than their peers in other countries. A similar trend is noticeable in other types of use of digital technologies in school as well (for example the use of a computer for working in a group and communicating with classmates, playing educational simulation games, reviewing subject matter, etc.).

Primarily, we are interested in the relationship between the availability and use of digital technologies and student performance in school. However, in the Czech Republic, the available information is incomplete and based solely on data from the PISA research. Particularly, there is a PISA 2006 secondary analysis (Kubiatko & Vlčková, 2010) that focused on the connection between the use of ICT by students

and their results in science. The results of the analysis suggested a positive relationship between ICT use and student knowledge in science. However, this data is rather old. Newer data notably include a secondary analysis by the CSI of the data from PISA 2012 (Czech School Inspectorate, 2016) that indicated that the use of ICT in school is connected to worse student results rather than better. Similar conclusions were also reached by an international report from the PISA 2012 research (OECD, 2015). According to this report, student ability in both mathematics and reading are generally lower in the countries in which the ratio of students using ICT in school is higher. Similarly, the PISA results suggest that in countries that focused more on the introduction of computers into schools between 2003 and 2012, students tend to achieve worse results. This could suggest that the implementation of digital technologies into teaching and education in schools represents a certain burden for the educators and can lead (at least temporarily) to a decrease in the quality of education. The newest research studies and reports are based on the data from the PISA 2015 research. These include our study focused on a topic similar to the one of this chapter (Juhaňák et al., 2018) and a secondary analysis conducted by the CSI (2018). In both cases, it appears that the relationship between the use of digital technologies and school results is rather more complicated. On one hand, the relationship regarding the use of ICT in school being connected to worse student results is confirmed; on the other hand, it was shown that perceived autonomy in ICT use is connected to significantly better performance of students in mathematics, reading, and science literacy. Thus it seems that this topic requires more scientific attention.

More detailed research of the influence of the use of digital technologies upon student results is lacking in the Czech Republic. It is necessary to turn to the results of foreign studies focusing on this topic, even though these might not completely map the situation in the Czech Republic and thus they cannot fully compensate for the lack of national research. The existing foreign studies include a few studies that found a positive relationship between the digital technologies usage and student results (for example Erdogdu & Erdogdu, 2015; Spiezia, 2010). Other studies found a negative connection between digital technologies and school performance (for example Leuven et al., 2007), and some studies failed to find any important connection (Falck et al., 2017; Wittwer & Senkbeil, 2008). Many studies provided mixed results (Biagi & Loi, 2013; Comi et al., 2017; Luu & Freeman, 2011; Ponzo, 2011; Skryabin et al., 2015). The study by Ponzo (2011) found a positive relationship between student results and the frequency of computer use in the home environment for school purposes, but also stated a negative connection between the use of a computer in school and student results. It is clear that the existing research has not yet provided unambiguous answers about the connections between the availability and the use of digital technologies and the educational results of students. The large variability and the frequent contradictions of the existing results can probably be explained by the varying focus of the individual studies, the complexity of the problems of digital technologies in education, and the use of a rather extensive number of heterogeneous methodological procedures (Biagi & Loi, 2013; Cox & Marshall, 2007).

The contradictory results and the gaps in the existing research show that it is necessary to better explore and understand the role of digital technologies in connection to student results. We used the data from the PISA 2018 research for these purposes. Using multilevel modeling, we identified various factors of availability and use of ICT that are related to the performance of students in school. The main goal of this chapter is to investigate and describe in what manner and to what degree the selected aspects of the availability and the use of digital technologies by Czech fifteen-year-old students inside and outside of school affect their performance in school.

The individual research questions that we sought to answer within the analyses were formulated in the following way:

- To what extent is the availability of ICT to students and the use of ICT by students in school related to their school performance?
- To what extent is the availability of ICT to students and the use of ICT by students at home related to their school performance?
- To what extent is student interest in ICT and their use of ICT in social interaction as well as their perceived competence and autonomy in ICT usage related to their school performance?

As we worked with data of a hierarchical nature (i.e. the students are nested within schools), multilevel modeling was used within the analyses. Because of its wide applicability, this method has recently acquired increased attention in educational science and in other scientific disciplines such as sociology and psychology as well (see Heck & Thomas, 2015; Hox, 2010; Snijders & Bosker, 2012). In the course of the analysis itself, we proceeded using the general strategy of gradual construction of a model; we created a separate model for each monitored area as dependent variables (i.e. student scores in mathematics, reading, and science literacy tests). We performed the analysis in the R statistical software (R Core Team, 2018) using the *BIFIEsurvey* library (BIFIE, 2018).

Table 4.1 shows the basic descriptive data of all quantitative variables used within the analyses. The table of correlations between the individual variables is attached at the end of the chapter (Table 4.6).

4.2 The Availability and Use of Digital Technologies in School

The analysis uses data from a total of 6992 students from 329 different schools (27 students from four special needs or practical schools). The students were fifteen or sixteen years old (mean = 15.8; sd = 0.28), and 50.1% of them were girls. The individual types of schools were: 130 (39.5%) primary schools, 48 (14.6%) secondary vocational schools without maturate, 53 (16.1%) secondary technical schools with maturate, 38 (11.6%) 8-year and 6-year gymnasiums, and 38 (11.6%) 4-year gymnasiums.

Table 4.1 Descriptive statistics of continuous variables used in the analysis

Variable name	Variable description	Mean	SD	Number of cases	% of missing
Mathematics	Score in mathematics	500.4	93.0	6992	0
Reading	Score in reading	491.2	97.1	6992	0
Science	Score in science	497.8	94.2	6992	0
ESCS	Index of economic, social, and cultural status	−0.20	0.87	6887	1.5
ICT availability in school	Availability of digital technologies in school	5.57	2.10	6584	5.8
ICT use in school in general	Use of digital technologies in school in general	0.07	1.03	6120	12.5
ICT use during lessons	Subject-related use of digital technologies during lessons	−0.32	0.91	6276	10.2
ICT use outside of lessons	Subject-related use of digital technologies outside of lessons	−0.21	1.08	5913	15.4
ICT availability at home	Availability of digital technologies at home	7.95	1.88	6656	4.8
ICT use at home for schoolwork	Use of digital technologies outside of school for school-related activities	−0.07	0.99	6079	13.1
ICT use at home for leisure activities	Use of digital technologies outside of school for leisure activities	0.01	1.00	6285	10.1
Interest in ICT	Interest in digital technologies	−0.22	0.91	6069	13.2
ICT competence	Perceived competence in the use of digital technologies	−0.18	0.92	5985	14.4
ICT autonomy	Perceived autonomy related to use of digital technologies	−0.15	0.91	5974	14.6
ICT in social interaction	Digital technologies as a topic in social interaction	−0.19	0.98	5915	15.4

From the total, 298 (90.6%) were public schools, 26 (7.9%) were private or church schools, and the remaining five schools (1.5%) were unclassified.

Before answering the first research question and creating a model including the availability and use of ICT in school variables, we created a "baseline model" for each monitored area. This decision was based on the fact that student performance in school can also largely be explained by variables and factors other than the variables concerning the availability and the use of digital technologies. These basic variables, such as the socioeconomic status of the student's family, student gender, and the type of school they attend, must be taken into consideration during modeling, or the effect of the ICT-related variables would be strongly overvalued. Therefore, before the actual analysis concerning digital technologies, a baseline model was created including only the factors commonly used to explain differences in student results that are

Table 4.2 Baseline regression models for student performance in tests of mathematics, reading, and science literacy

	School performance		
	Mathematics	Reading	Science
Fixed effects	***Coefficients (SE)***	***Coefficients (SE)***	***Coefficients (SE)***
(intercept)	495.84 (4.56)	486.92 (4.71)	494.18 (4.50)
Gender	−7.80 (1.55)***	9.67 (1.14)***	−5.55 (1.59)**
ESCS	17.58 (1.67)***	14.69 (1.55)***	14.72 (1.65)***
ESCS (school level)	47.32 (7.39)***	53.37 (7.87)***	51.87 (7.51)***
8-year and 6-year gymnasiums	72.73 (8.76)***	76.83 (10.02)***	76.05 (10.30)***
4-year gymnasiums	71.63 (8.46)***	69.21 (7.62)***	64.72 (8.03)***
Secondary technical schools	33.54 (6.30)***	38.71 (5.96)***	34.47 (6.91)***
Secondary vocational schools	−22.36 (6.87)**	−24.2 (6.62)***	−24.14 (6.09)***
Private schools	−29.72 (8.38)***	−34.91 (9.97)***	−32.23 (10.19)**
Random effects			
Residual variance	4439.4 (69.8)	4695.4 (40.2)	4602.8 (73.4)
Intercept variance	648.5 (129.0)	812.6 (176.7)	743.3 (138.4)
Explained proportion of variance			
At the student level	0.066	0.052	0.043
At the school level	0.830	0.820	0.817

*p < 0.05; **p < 0.01; ***p < 0.001

at the same time not connected to the problems of digital technologies. Specifically, it included five basic variables: student gender, the socioeconomic status of the students' family, average socioeconomic status at the school level, type of school, and an indicator of whether the school was public or private. The explained variance at the student level and at the school level can be understood as a baseline value to the later models built within the analysis itself. The results of the subsequent models, which already contain the ICT-related variables, can thus be compared to these original models and insight can be gained into how much of the explained variance (above the baseline models) can be attributed to ICT-related factors.

The results of the baseline models for all three monitored areas (i.e. mathematics, reading, and science) are listed in Table 4.2. In order to better understand the stated regression coefficients, "dummy coding" has been used in the "type of school" and a primary school was used as the reference category. Effect coding was then selected for student gender. The constant of stated models thus corresponds to the average result of a student in the given area who attends public primary school in the Czech Republic. The coefficient of the socioeconomic status at the student level (ESCS) can then be used as an example of the interpretation of listed coefficients. For mathematics, this coefficient can be interpreted in the following way: on average, students with socioeconomic status higher by 1 point achieve results higher by 17.58 points in mathematics literacy. For the coefficient for gender, with regard to the used effect coding, the results of mathematics literacy can be interpreted as girls achieving results worse by 7.8 points than an average student, and results

Table 4.3 Regression coefficients for student performance in mathematics, reading, and science as dependent variables and the availability and the use of digital technologies in school as independent variables

	School performance		
	Mathematics	Reading	Science
Fixed effects	***Coefficients (SE)***	***Coefficients (SE)***	***Coefficients (SE)***
(…)	*(…)*	*(…)*	*(…)*
ICT availability in school	−0.94 (0.62)	−1.33 (0.64)*	−0.92 (0.70)
ICT use at school in general	−9.05 (1.47)***	−11.47 (1.31)***	−9.84 (1.61)***
ICT use during lessons	3.22 (1.67)	2.35 (1.41)	1.89 (1.67)
ICT use outside of lessons	−1.80 (1.52)	−2.02 (1.29)	−1.48 (1.38)
Use of internet in school			
1 to 30 minutes	3.30 (3.83)	2.73 (3.53)	0.84 (3.82)
31 to 60 minutes	−6.40 (4.80)	−5.09 (4.48)	−5.09 (4.79)
1 to 4 hours	−13.03 (4.40)**	−14.39 (4.61)**	−17.06 (4.65)***
Over 4 hours	−31.26 (6.65)***	−29.35 (6.26)***	−31.87 (6.09)***
Random effects			
Residual variance	4242.7 (71.1)	4372.9 (34.8)	4294.7 (66.2)
Intercept variance	422.1 (109.7)	439.4 (110.0)	444.3 (100.9)
Explained proportion of variance			
At the student level	0.134	0.131	0.118
At the school level	0.873	0.884	0.871

*p < 0.05; **p < 0.01; ***p < 0.001

worse by 15.6 (i.e. 2 × 7.8) points than boys. For reading literacy, the situation is inverted, and girls achieve on average results better by 19.34 points (i.e. 2 × 9.67) than boys. In the individual types of schools, the coefficient expresses the better or worse results that the students of the given type of school achieved on average in comparison to the students from primary schools.

As soon as we had an original baseline model for every area presented above, it was possible to create models for the availability and use of digital technologies in school. We used the following process for creating the models: we kept all the variables from the previous model in this new model (all of them were statistically significant) and added one variable concerning the availability of ICT in school, three variables concerning the use of ICT in school and during lessons, and one categorical variable concerning the amount of time the students spend on the Internet in school. The resulting models are presented in Table 4.3. For the sake of clarity, only parameters concerning the availability and the use of ICT in school are listed; other parameters have been omitted from the table, even though they were included in the given models.

Table 4.3 shows that the general use of digital technologies in school and the use of the Internet in school are the main factors related to the school performance of students in all three monitored areas. On the contrary, the subject-related use of digital technologies seems insignificant in all areas, whether it concerns use directly in lessons or outside of lessons. For reading literacy, the availability of digital technologies in school was also revealed to be a statistically significant factor. However,

as the coefficient was very small, it probably reflects an objectively insignificant connection.

For both the general use of digital technologies in school and the use of the Internet in school, the discovered significant relationship to student performance was negative. Specifically, this means that the more students use digital technologies in the school environment, the worse results they achieve in the monitored areas. The strongest connection was noticeable for reading literacy: a decrease by approx. 11.5 points. For mathematics literacy, the decrease is slightly smaller: approx. 9 points. A similar situation is true for the use of Internet in school: the more time the students spend on the Internet in school, the worse their results. Statistically significant worsening in comparison to students not using the Internet in school at all are seen even in the 1- to 4-hour group. The students who stated that they use the Internet in school for more than 4 hours a day achieve even worse results. On average, these students achieve results worse by approximately 30 points in the tests of mathematics, reading, and science literacy.

4.3 The Availability and Use of Digital Technologies at Home

Within the second research question, we shifted our attention toward variables concerning the availability and the use of digital technologies in the home environment. In the course of creating the model, we kept all the existing statistically significant parameters in each model and added new variables related to the availability and the use of ICT at home. Similarly to the use of digital technologies in school, this first concerned one variable regarding the availability of ICT in the home environment, then two variables concerning the use of ICT at home, and finally a single categorical variable concerning the amount of time students spent every day on the Internet at home in the course of a regular workweek. The resulting models are presented in Table 4.4; for the sake of clarity, only the current parameters concerning the availability and the use of ICT in the home environment are listed.

Table 4.4 shows that all variables concerning the availability and the use of digital technologies at home appear to be statistically significant in at least some of the monitored areas, but the situation is rather different in each. Digital technologies seem to play the largest role in connection to reading literacy. In this field, all of the analyzed variables appear statistically significant. There is a positive connection with the use of digital technologies during leisure time and the use of the Internet; the connection is negative for the availability of ICT at home and the use of digital technologies at home for school purposes. At the same time, the connection to reading literacy does not seem to be linear for the use of the Internet. Students using the Internet less than 1 hour a day (i.e. the reference category) achieve the worst results of all. Students using the Internet between 2 and 4 hours score 9.6 points, and students using it 4 and 6 hours a day score 12.06 points, a statistically significant difference. However, students who spend more than 6 hours a day on the Internet achieve worse results that do not differ significantly from the results of students who use the Internet less than 1 hour. Therefore, no clearly linear relationship applies, such as the

Table 4.4 Regression coefficients for student performance in mathematics, reading, and science as dependent variables and the availability and the use of digital technologies at home as independent variables

	School performance		
	Mathematics	Reading	Science
Fixed effects	***Coefficients (SE)***	***Coefficients (SE)***	***Coefficients (SE)***
(…)	*(…)*	*(…)*	*(…)*
ICT availability at home	−0.42 (0.83)	−2.40 (0.76)**	−1.89 (0.80)*
ICT use at home for schoolwork	−1.67 (1.78)	−5.09 (1.31)***	−5.88 (1.41)***
ICT use at home for leisure activities	3.77 (1.86)*	6.8 (1.45)***	5.05 (1.52)**
Use of internet at home			
1 to 2 hours	3.59 (4.24)	6.16 (4.09)	7.2 (4.61)
2 to 4 hours	10.48 (4.36)*	9.6 (3.77)*	6.43 (4.27)
4 to 6 hours	6.72 (5.35)	12.06 (4.48)**	5.39 (5.24)
Over 6 hours	−0.25 (5.21)	5.98 (4.86)	4.53 (5.34)
Random effects			
Residual variance	4223.5 (60.2)	4318.3 (36.3)	4275.9 (70.4)
Intercept variance	443.1 (103.4)	492.8 (112.1)	513.7 (107.4)
Explained proportion of variance			
At the student level	0.137	0.147	0.128
At the school level	0.869	0.874	0.856

*p < 0.05; **p < 0.01; ***p < 0.001

more frequent use of the Internet being connected to better reading literacy. Rather, the excessive use of the Internet has a (negative) effect upon the study performance of the students similar to the effect of minimum or no use of the Internet. On the contrary, a positive effect is connected to a "medium rate" of Internet use.

Internet use in the home environment connects to a similar situation in mathematics and partially also to science, but the differences do not appear statistically significant here. In all three areas, a significant positive connection to the use of Internet for leisure activities appears. Thus it seems that informal learning, subsequently also influencing student school performance, occurs within the use of ICT in free time. By contrast, the negative connection between the use of digital technologies at home for school purposes and the results in reading and science literacy is rather surprising. In both fields, students using digital technologies for school purposes to a larger extent achieve worse results.

4.4 The Role of ICT in Student Life in Relation to School Performance

In connection to the third research question, we focused on a total of four variables and their relationship to mathematics, reading, and science literacy. Specifically, this concerned an interest in digital technologies, the use of digital

Table 4.5 Regression coefficients for student performance in mathematics, reading, and science as dependent variables and the interest in ICT, ICT in social interaction, ICT competence, and ICT autonomy as independent variables

	School performance		
	Mathematics	Reading	Science
Fixed effects	***Coefficients (SE)***	***Coefficients (SE)***	***Coefficients (SE)***
(…)	*(…)*	*(…)*	*(…)*
Interest in ICT	0.25 (1.89)	4.20 (1.84)*	2.78 (2.20)
ICT in social interaction	−5.66 (1.9)**	−12.31 (1.81)***	−9.89 (1.70)***
ICT competence	2.51 (1.97)	3.09 (1.96)	1.8 (2.34)
ICT autonomy	12.08 (1.86)***	13.24 (1.74)***	13.55 (1.93)***
Random effects			
Residual variance	4142.7 (64.0)	4173.4 (41.2)	4156.8 (72.4)
Intercept variance	393.1 (94.3)	445.2 (101.0)	486.7 (101.0)
Explained proportion of variance			
At the student level	0.161	0.177	0.155
At the school level	0.883	0.886	0.863

*p < 0.05; **p < 0.01; ***p < 0.001

technologies in everyday social interaction with peers, perceived competence in the use of digital technologies and the perceived autonomy connected to the use of digital technologies. Again, we created the models by keeping all the variables that proved to be statistically significant in the previous step in each model. Subsequently, we added the four variables that are at the center of attention of the third research question. Table 4.5 shows the models in a form in which only the coefficients for the four variables are displayed, even though all statistically significant variables from the previous models were a part of the model specifications.

The results in Table 4.5 outline a rather clear image with certain differences between the individual areas. Table 4.5 shows that the perceived autonomy connected to the use of digital technologies has the largest impact on student results in tests of mathematics, reading, and science literacy. This connection is positive and of similar strength in all monitored areas (approx. 13 points). Students who feel independent in their use of digital technologies achieve significantly better results than other students. On the other hand, there is a statistically significant negative connection to student results in the use of digital technologies in everyday social interaction. The more students use digital technologies within everyday social interaction, the worse results they achieve in school performance. This connection appears across all monitored areas, but in contrast to the ICT autonomy, there are significant differences in its extent in the individual areas. This difference constitutes less than 6 points for mathematics; it is more than double for reading literacy.

4.5 Conclusion

The goal of this chapter was to investigate the differences between the availability and the use of digital technologies by Czech fifteen-year-old students and their school performance as measured by mathematics, reading, and science literacy tests. In terms of the availability and the use of digital competencies, we focused on the school environment (question 1), home environment (question 2), and variables concerning interest in ICT, competence and autonomy in the use of ICT and the role of digital technologies in everyday social interactions (question 3). In order to answer the set research questions, we performed a multilevel regression analysis of data acquired in the Czech Republic within the PISA 2018 research.

For first research question and the availability or the use of digital technologies in the school environment, a significant negative relationship between the general use of digital technologies by students in school and their performance was one of the main findings. However, this connection was not a complete surprise, because similar results were acquired from the data of the PISA 2012 research (Czech school inspectorate, 2016; OECD, 2015) and in our analysis of PISA data from 2015 (Juhaňák et al., 2018). In our 2018 study, we provided an explanation for this phenomenon and warned that the negative effect of the use of ICT in school on student results has to be interpreted cautiously and with regard to how exactly this variable is conceived within the research and what exactly it quantifies. We are convinced that this variable cannot be perceived as a characteristic of how much digital technologies are generally used in a given school or even within teaching; it is an individual characteristic of how much each student uses digital technologies in the school environment. The variable has to be understood as the extent of the use of digital technologies in school by the student, but also (and seemingly primarily) without connection to teaching. Incidentally, the variable concerning the general use of ICT in school by a student originates from rather general items that are not related to the direct use of ICT for teaching-related activities, such as chatting online at school and using email at school. Thus it can be presumed that the high values of general use of ICT in school can be attributed to the students who do not pay attention to the subject matter in lessons and instead chat online with their friends. In such cases, the negative connection to school performance would not be very surprising.

Our interpretation can be further supported using the variables of subject-related use of digital technologies during lessons and the subject-related use of digital technologies outside of lessons; these variables were used for the first time in the PISA 2018 research. The results have unambiguously shown that both variables concerning the subject-related use of digital technologies and especially the variable concerning the use of digital technologies directly in lessons measure completely different elements than the variable concerning the use of digital technologies at school in general. Therefore, under the variable concerning the general use of digital technologies in the school environment, we have to understand the use of digital technologies by the students unrelated to the teaching of specific subjects and not taking place directly within the lesson. It seems that these are truly activities that take place outside of teaching, such as during school breaks, or rather despite

teaching, such as when the student does not pay attention to the lecture and instead uses their smart phone. This explanation also complies with the results concerning the frequency of the use of the Internet in school, showing that the more students use the Internet in school, the worse their results. The obvious explanation is that student use of the Internet in school need not be related to teaching, such as when students communicate with their peers over the Internet instead of paying attention to the lesson. For that matter, the students themselves stated that for some of them smart phones are a distraction from lessons that divert their attention from the teacher's lecture (see Chap. 3), and thus such a use of digital technologies is in no way connected to the lesson itself.

Within the second research questions, we focused on the availability and the use of digital technologies by fifteen-year-old students in the home environment. We paid attention to the use of digital technologies at home for school-related activities and for leisure activities. In this context, the results indicating a significant connection between the use of digital technologies for leisure activities and student results in mathematics, reading, and science literacy should be considered especially surprising. In our previous study (Juhaňák et al., 2018) focusing on the data from the PISA 2015 research, this variable did not appear to be a statistically significant predictor of the student performance in school. The not negligible three-year difference between the studies may represent a certain explanation. This means that there may be a significant difference between fifteen-year-old students in 2015 and fifteen-year-old students in 2018 in terms of their use of digital technologies in their free time and how this use affects their performance in school.

The significant negative relationship between the school results of students and the use of digital technologies in the home environment for school-related purposes, such as doing homework on the computer, is less surprising but more difficult to interpret. This relationship appeared only in connection to reading and science literacy, which corresponds with the results of our study analyzing data from the older PISA research (Juhaňák et al., 2018). The manner of interpretation of this relationship remains a question that will probably require further studies and analyses to answer. Nevertheless, we offer an interpretation that we believe to be somewhat supported by the existing research and data. It is possible that in this relationship, the inadequate preparation of teachers for the efficient use of digital technologies for education purposes, and especially for the purposes of student homework, plays a certain role. Several studies and assessments have indicated that teachers have inadequate professional training in connection to the use of digital technologies (compare for example Kašparová et al., 2014; Zounek & Šeďová, 2009). Thus we can imagine that teachers do not know how to give students homework that would effectively include digital technologies. Therefore, the use of digital technologies in the home environment for school-related purposes in fact leads to worse study results instead of improving them. A certain support for this claim can also be found in Chap. 3, in which we showed that Czech teachers use digital technologies primarily in connection with simpler, transmission-oriented teaching activities such as creating presentations. The digital technologies are not included in teaching in a more sophisticated manner, which obviously also influences the assignment of homework to the students.

For the second research question, we paid more attention to the use of Internet by students in the home environment during a regular weekday. To a great extent, the results once against correspond with the analyses of data from the PISA research from the previous year (for example Czech school inspectorate, 2016; OECD, 2015). The primary attention thus far has been focused on the negative effects of the excessive use of the Internet by students on their study results. However, our analyses also showed a positive connection between the use of the Internet and performance in school if the Internet was used to a reasonable extent. By contrast, worse results are connected either to an extreme overuse of the Internet (over 6 hours a day) or to a very low use of the Internet (less than an hour a day). The simple rule presented in some existing studies and analyses stating that the more students use the Internet at home, the worse their study results are, does not apply in this case.

In the last research question, we focused on four variables concerning student experience with ICT. These results were not very surprising because they corresponded with our analyses from the previous years (Juhaňák et al., 2018) to a great extent. Nevertheless, a certain shift has occurred since the 2015 research. While the positive connection between student autonomy in the use of digital technologies and their results in mathematics, reading, and science literacy is a bit lower than in 2015, the negative connection between the use of digital technologies for the purposes of everyday social interactions with peers and the performance in school is rather stronger, especially in reading literacy. These connections and their changes in comparison to the previous research do not offer a straightforward interpretation. Nevertheless, we can presume that for ICT autonomy, the connection to better school results is due primarily to the more successful students being able to generally work and function more autonomously, which is subsequently reflected in the autonomy connected to the use of digital technologies. In connection to the use of ICT for everyday social interaction, a possible explanation is that students use communication with their peers as an activity that distracts them from the learning itself, procrastinating by communicating on social networks or via messaging applications; thus the higher degree of use of digital technologies for the purposes of social interaction leads to worse results in school.

The results of the performed analyses offer an important insight into how the availability and the use of digital technologies by Czech fifteen-year-old students is connected to their school performance. The presented results are even more important with regard to the design of the PISA 2018 research, because they can be generalized to the entire population of Czech fifteen-year-old students (except for the students of practical and special needs schools). On the other hand, the quantitatively oriented approach selected for this chapter does not enable deeper insight into the ways that today's students use digital technologies both inside and outside of school. For this reason, we focus on a number of the topics discussed above in Chap. 8 using a qualitative methodology that enables a detailed investigation of the ways that adolescents use digital technologies during everyday activities in various contexts. The results presented here will thus be put in the wider context of the everyday life of present-day adolescents in Chap. 8.

Appendix

Table 4.6 Correlation matrix of the variables used in the analysis

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. Mathematics	1														
2. Reading	0.787***	1													
3. Science	0.818***	0.844***	1												
4. ESCS	0.426***	0.405***	0.407***	1											
5. ICT availability in school	−0.003	−0.025	−0.014	0.035	1										
6. ICT use in school in general	−0.136***	−0.176***	−0.154***	−0.014	0.174***	1									
7. ICT use during lessons	−0.039	−0.057**	−0.053**	−0.002	0.133***	0.197***	1								
8. ICT use outside of lessons	−0.059**	−0.066***	−0.061**	0.001	0.074***	0.192***	0.394***	1							
9. ICT availability at home	0.042*	−0.013	0.005	0.269***	0.216***	0.147***	0.081***	0.052**	1						
10. ICT use at home for schoolwork	−0.038*	−0.080***	−0.076***	0.034*	0.132***	0.497 ***	0.119***	0.172***	0.116***	1					
11. ICT use at home for leisure activities	−0.043*	−0.062**	−0.046*	−0.026	0.028	0.352***	0.077***	0.105***	0.126***	0.447***	1				
12. Interest in ICT	0.006	0.011	0.021	−0.029	−0.006	0.194***	0.078***	0.049*	0.073***	0.206***	0.392***	1			
13. ICT competence	0.072***	0.030	0.060**	0.026	0.005	0.163***	0.075***	0.057***	0.119***	0.194***	0.362***	0.552***	1		
14. ICT autonomy	0.122***	0.064***	0.118***	0.052**	0.016	0.135***	0.048**	0.042**	0.112***	0.178***	0.357***	0.493***	0.649***	1	
15. ICT in social interaction	−0.072***	−0.184***	−0.108***	−0.057***	0.055*	0.255***	0.074***	0.085***	0.136***	0.277***	0.395***	0.401***	0.511***	0.556***	1

*p < 0.05; **p < 0.01; ***p < 0.001

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Part II
Digital Teens' Use of Digital Technologies in the Family Context

Chapter 5
Home Use of Digital Technologies by Teens: The Role of Family, School, and Peers

Abstract The use of digital technologies is an important part of life for most adolescents. Digital technologies can play a role of varying significance in their everyday lives, and the adolescents may use the digital technologies in differing degrees. In this chapter, we focus on investigating and uncovering various factors, such as the personality characteristics of the adolescents, family background, the use of digital technologies in school, and the use of digital technologies in communication with peers, that can contribute to explaining the degrees of use of ICT by present-day (Czech) adolescents. We focus on the use of digital technologies outside of school, specifically in the home environment, maintaining the important distinction in the use of digital technologies for leisure activities and the use of digital technologies for school activities such as homework.

In the first part of the chapter, we state the topic of the chapter and gradually present various aspects that the existing research indicates can play important roles in the use of digital technologies by present-day fifteen-year-olds. We then describe a conceptual model that we use in the subsequent analyses. We present research questions, and we describe the methodology of this part of the research, including a basic description of the individual variables used in the analyses. In the subchapters, we present the results of the analyses and we provide answers to the set research questions. In the final part, we summarize our findings and set them in a wider context.

Keywords Digital technologies · Adolescent · School · Family · Peers · Leisure activities · Homework · PISA

5.1 Theoretical Background

Digital technologies have become an integral part of life for present-day (Czech) adolescents. Digital competencies are considered one of the pillars of education, and these competencies are necessary for an individual's life in twenty-first century

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society and for options on the job market (Conrads et al., 2017; Martin & Grudziecki, 2006). The very active use of digital technologies is an important prerequisite for achieving digital competencies; the topic of digital competency is addressed in more detail in Chap. 7 (Alkan & Meinck, 2016; Fraillon et al., 2014; Hatlevik et al., 2015; Juhaňák et al., 2019; Livingstone & Helsper, 2007; Rohatgi et al., 2016; Vekiri, 2010). It is necessary to be in contact with digital technologies and to be able to use them adequately in everyday situations and in dealing with specific problems.

At the same time, it is necessary to realize that even though this can be seen as a "digital age" and it may seem that ICT are available almost universally, some differences remain in access to digital technologies, especially in the degree and manner of their use across various groups of children and adolescents. These differences may mean that children have not yet had equal educational opportunities and conditions for developing these crucial digital competencies. In the existing educational research, inequalities in education as well as in the availability and the use of digital technologies are very often connected to the students' family background (García & Weiss, 2017; Schmeer & Yoon, 2016; Thomson, 2018; Torres, 2016; Volante et al. 2019). Traditionally, families are divided into those with higher and lower socioeconomic status, and studies have discussed the successes of students from families with higher socioeconomic status and the failures of students from families with lower socioeconomic status. These differences have been explained in several ways – for example, by the theory of language codes (Bernstein, 1971) and by cultural capital theory (Bourdieu, 1986). In connection to digital technologies, the attention of researchers has been focused primarily on the availability of digital technologies and the dependence of the availability of digital technologies on the family socioeconomic status. Many studies have focused on the connection between socioeconomic status and the ownership of a computer. The existing research show that families with low socioeconomic status have rather limited access to digital technologies (computer, Internet, mobile phone, television, etc.) in comparison to families with higher socioeconomic status (Harris et al., 2017; Kim et al., 2011; McKenney & Voogt, 2010; Robinson, 1998; Tang, 2015). However, some studies found no connection at all between socioeconomic status and computer ownership (Gorski, 2005; Looker & Thiessen, 2003; Tondeur et al., 2011; van Braak & Kavadias, 2005).

Apart from investigating the connections between socioeconomic status and computer ownership or the availability of digital technologies in general, the existing research has also focused on the connection between socioeconomic status and children's attitudes toward digital technologies. Vekiri (2010) points out that children generally exhibit a rather positive approach toward digital technologies regardless of their family socioeconomic status. At the same time, children from families with lower socioeconomic status tend to have lower self-confidence when it comes to the evaluation of their own skills in ICT use. Other studies have focused on the connection between socioeconomic status and digital competence of children and adolescents (see for example Hatlevik et al., 2015; Hatlevik & Christophersen, 2013). Scherer and Siddiq (2019) showed that differences in the level of digital literacy can be at least partially attributed to differences in socioeconomic status.

Similarly, Hatlevik et al. (2018) showed that the socioeconomic status of a child's family is an important predictor of their computer and information literacy.

However, a number of studies focusing on the family socioeconomic status in connection to ICT use have some limitations. Most existing studies focus only on socioeconomic status as a single aggregate metric and thus do not differentiate between the individual aspects of the socioeconomic status, such as parental income or education. These factors can play different roles in the use of digital technologies by children. Incidentally, Bourdieu (1986), in his theory of capital, which can be a viewed as the starting point of the current concept of socioeconomic status, considered it necessary to differentiate among various forms of capital, specifically economic capital, social capital, and cultural capital. This has influenced the current concept of socioeconomic status, within which three basic components – income, education and occupation – are usually distinguished (Baker, 2014; Duncan et al., 1972; Gottfried, 1985; Hauser, 1994; Mueller & Parcel, 1981). In recent years, these three basic components are usually complemented by aspects of household assets, categorized as wealth, household possessions, and home resources (Duncan & Brooks-Gunn, 1997; Entwisle & Astone, 1994). It is clear that socioeconomic status, as a multi-layered construct, can influence the use of digital technologies by children in many different ways. University-educated parents may approach digital technologies in the family differently than parents with lower education. Similarly, in a family owning a wide spectrum of digital technologies, the children can use the digital technologies differently than children from a family owning a limited number of digital technologies.

In connection to the family socioeconomic status or the family in general, it is necessary to keep in mind that this is just one of the factors or contexts that can play a role in the use of digital technologies by present-day adolescents. A number of factors, such as personality traits or individual preferences, may also affect the use of digital technologies by teens. Other factors include the school the individual attends or the peers they meet and spend their free time with.

Gender is a basic personality characteristic that is a focus of attention in the research of digital technologies in the life and education of adolescents. Differences between boys and girls in their use of digital technologies have been repeatedly found in numerous aspects connected to ICT use. Drabowicz (2014) stated that boys generally use digital technologies, specifically computers, more frequently than girls, both for educational purposes and for communication. On the other hand, the results of a study by Aesaert & van Braak (2015) showed that on average girls have better ICT skills and demonstrate higher-order ICT competencies than boys. Likewise, the results of the International Computer and Information Literacy Study (ICILS) research (see Fraillon et al., 2014) showed that girls achieved better results than boys in computer and information literacy. At the same time, the ICILS results suggest that girls evaluate their competencies in the field of advanced abilities as worse than those of boys. This has been reported in other studies (for example Hargittai & Shafer, 2006), according to which boys tend to overestimate their digital abilities, while girls tend to underestimate themselves in this field.

In terms of personal preferences, these primarily concern a general interest in digital technology, specifically an inner motivation to use ICT in connection to the use of digital technology. Goldhammer et al. (2016) and Zylka et al. (2015) wrote about ICT interest as a cognitive-motivational factor or a content-specific motivational disposition manifested by the long-term preference of an individual to participate in activities requiring the use of digital technologies (Goldhammer et al., 2016). This preference can stem from positive feelings connected to ICT use as such and from the realization of the value or benefit of the use of specific technological tools to fulfill personal goals (Christoph et al., 2015; Goldhammer et al., 2016; Zylka et al., 2015). Some adolescents may naturally prefer to use digital technologies more frequently than others because the use of digital technologies evoke pleasant feelings in them. Other times, the preference for ICT use can originate in an adolescent who realizes that the use of the given digital technology brings something, such as making it possible to handle a certain task more efficiently. Whatever the cause of this interest or motivation to use ICT, it seems clear from the existing studies that the interest in digital technologies is related to their more frequent use, which in turn leads to a higher digital competence in their use (De Wit et al., 2012; Rohatgi et al., 2016; Scherer et al., 2017; Senkbeil & Ihme, 2017).

Even though it is increasingly clear that school and formal education are only one of the contexts in which children and young people can develop their digital competencies (comp. Arnseth et al., 2016; Erstad, 2012), this is still a factor worth considering when studying ICT use by present-day young people, not least because in school, the students can acquaint themselves with a new piece of digital technology or a program they may subsequently use for out-of-school activities and in their free time as well (see some examples in Chap. 3). The school and the teachers can thus affect how adolescents use the digital technologies. At the same time, the school should play a role in the development of digital literacy, which can be considered one of the key tasks of schools (comp. Erstad, 2011; Knobel & Kalman, 2016; Lankshear & Knobel, 2008; Sefton-Green et al., 2009; Tsitouridou & Vryzas, 2011). On the other hand, the existing studies have reported the rather limited abilities of schools to contribute to student development of digital competencies. A number of studies (for example Aesaert et al., 2015; Hatlevik et al., 2018) suggested that the differences in student ICT competencies can be better explained by factors other than school. Thus it remains a question how much the use of digital technologies in school really influences the use of digital technologies by adolescents outside of school. The role of school cannot be completely disregarded, if only because the school also has a function related to levelling inequalities in society, which can be especially important in the context of digital technologies. Studies have suggested that in this respect the school can play an absolutely fundamental role, especially in students from families with low socioeconomic status (Vekiri, 2010).

Finally, there is the context of friends or peers, which can undoubtedly play a certain role in how and to what extent adolescents use digital technologies. In their research, Verhoeven et al. (2016) focused on university students, concluding that peers are one of the most important sources of information on ICT, and they are the first people students turn to when they need help with a technical problem. We can

expect for a similar situation to predominate among peers in primary and secondary schools as well (see for example Itō, 2009). According to the research by Vekiri (2010) peers play an indispensable role, especially in children with lower socioeconomic status, since they can make up for insufficient family support in this field.

These results from earlier studies served as a point of origin for our own analyses. Data from the PISA 2018, specifically the data acquired in the Czech Republic, were used in the analysis. The PISA research is among the international large-scale assessments (ILSA) that focus on the comparison of selected indicators across various countries and regions of the world. The PISA research is aimed at fifteen-year-old students and focuses primarily on measuring and comparing reading, science, and mathematical literacy. Large amounts of other data on respondents, such as their families and specific ICT use by students are also available. These data were possible to use for our secondary analysis.

The goal of this chapter is to assess and describe in what manner and to what extent selected personality and family characteristics and also peer- and school-related characteristics influence the ICT use by fifteen-year-old students in the Czech Republic. It focuses on the use of ICT in the home environment, but, unlike other studies, we also distinguish two basic purposes for which the digital technologies are used by adolescents: leisure activities (playing computer or online games, online chatting, surfing the Internet for fun, etc.) and school-related activities (using e-mail or social networks for communication with classmates or teachers, surfing the Internet in the course of preparation for school, doing homework on the computer or a mobile phone, etc.). The Fig. 5.1 depicts a basic conceptual model of the relationships between the individual assessed areas (and specific variables in those areas) and the degree of the ICT use by adolescents in the home environment.

Based on this conceptual model, we focused on four main research questions:

- To what extent do adolescent gender and interest in ICT affect their use of ICT for schoolwork and leisure activities?
- To what extent does adolescent family socioeconomic background affect their use of ICT for schoolwork and leisure activities?
- To what extent does ICT use at school affect adolescent use of ICT for schoolwork and leisure activities?
- To what extent does the number of adolescent ICT-related social interaction with peers affect their use of ICT for schoolwork and leisure activities?

Multilevel modeling was used for the data analysis (comp. Heck & Thomas, 2015; Snijders & Bosker, 2012), which is a suitable method if the analyzed data are of a hierarchical nature (i.e. students nested within schools), such as in the PISA 2018 research. All analyses were performed separately for each of the analyzed dependent variables (i.e. ICT use for school-related activities and ICT use for leisure activities). Table 5.1 presents the basic descriptive data of all quantitative dependent and independent variables used within the analyses. The table of correlations between the individual variables is attached at the end of the chapter (Table 5.8).

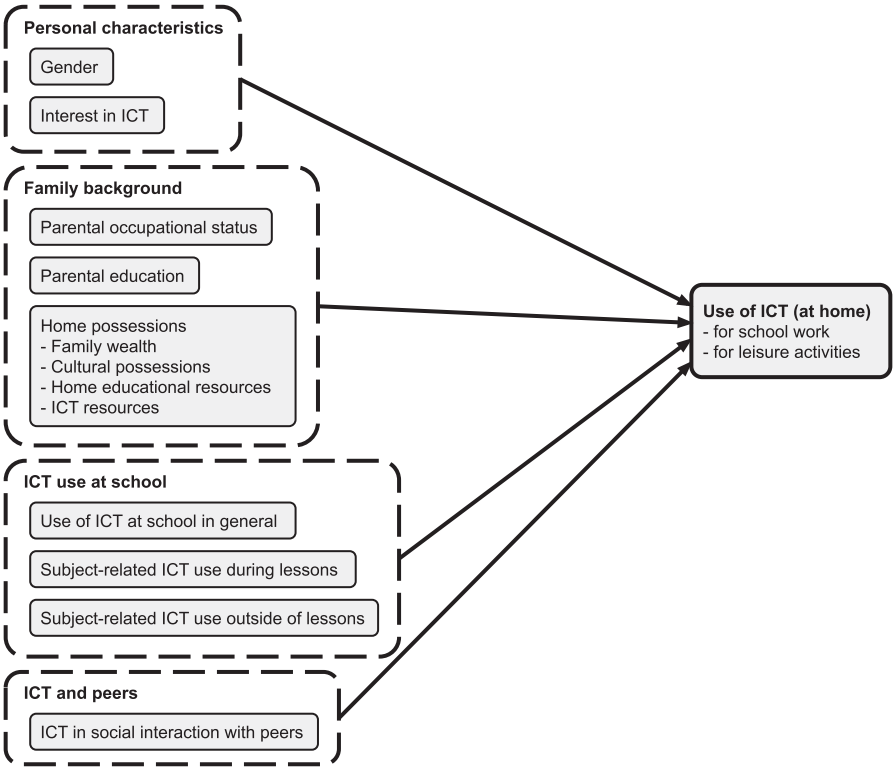

Fig. 5.1 Conceptual model of the relationships among selected personal characteristics, family background, the use of ICT at school, the role of ICT in interaction with peers, and the use of ICT at home for leisure activities and for school-related activities

5.2 Gender and ICT Interest as Predictors of ICT Use by Young People

The analyzed data include information from a total of 7019 students from 333 different schools. 50.1% of the total amount of students are girls; participants were fifteen- or sixteen-year-old students (range = 15.25, 16.33; mean = 15.8; sd = 0.281). In connection to the first research question concerning the relationships between the personality characteristics of the adolescents (specifically, we focused on gender and interest in ICT) and the degree of use of ICT outside of school for leisure activities and for school-related activities, we first checked the above mentioned quantitative variables to see whether they differed on the basis of gender. These data are listed in Table 5.2, which clearly shows an unambiguous trend in which boys achieve higher scores than girls in all three variables. It seems that on average boys are more interested in ICT, and they use ICT more in their time outside of school, even for

Table 5.1 Descriptive statistics of continuous variables used in the analysis

Variable name	Variable Description	Min	Max	Mean	SD	% of missing
ICT use for school purposes	ICT use outside of school for school-related activities	−2.30	3.31	−0.07	0.99	13.4
ICT use for leisure activities	ICT use outside of school for leisure activities	−3.59	4.25	0.01	1.00	10.5
Interest in ICT	Interest in ICT	−2.95	2.68	−0.22	0.91	13.5
Parental occupation	Highest parental occupational status	11.01	88.96	49.07	20.13	7.4
Parental education	Highest parental education (in years of schooling)	3.00	16.00	13.41	2.50	2.5
Home possessions	Home possessions	−8.62	4.99	−0.05	0.85	0.8
Family wealth	Family wealth	−6.89	4.08	−0.13	0.85	1.0
Cultural possessions	Cultural possessions at home	−1.91	2.06	−0.23	1.07	2.6
Educational resources	Home educational resources	−4.41	1.21	0.09	0.92	1.6
ICT resources	ICT resources at home	−3.80	3.60	−0.09	0.77	1.1
ICT use at school in general	Use of ICT at school in general	−1.72	3.30	0.07	1.03	12.8
ICT use during lessons	Subject-related ICT use during lessons	−1.22	2.44	−0.32	0.91	10.6
ICT use outside of lessons	Subject-related ICT use outside of lessons	−1.30	2.50	−0.21	1.08	15.8
ICT in social interaction	ICT as a topic in social interaction	−2.18	2.36	−0.19	0.98	15.7

Table 5.2 Differences in ICT use for school-related activities, ICT use for leisure activities, and interest in ICT, according to gender

	Males			Females		
	Number of cases	Mean	SD	Number of cases	Mean	SD
ICT use for school purposes	3008	−0.04	1.14	3071	−0.11	0.81
ICT use for leisure activities	3119	0.21	1.17	3166	−0.18	0.74
Interest in ICT	3016	−0.09	1.01	3053	−0.35	0.77

school activities. The differences between boys and girls are much smaller in ICT use for school purposes than in ICT use for leisure activities. We can conclude that boys generally tend to use digital technologies more than girls.

Apart from differences on the basis of gender, we focused on the correlation between the independent variable (Interest in ICT) and both dependent variables (ICT use outside of school for school-related activities and for leisure activities). These data and all other calculated correlations are available in the table at the end of the chapter. There is a clear and non-negligibly high connection between the interest

Table 5.3 Regression coefficients for student use of ICT as dependent variables, and gender of student and ICT interest as independent variables

	ICT use for school purposes	ICT use for leisure activities
Fixed effects	***Coefficients (SE)***	***Coefficients (SE)***
(Intercept)	−0.02 (0.02)	0.11 (0.01) ***
Gender	−0.01 (0.02)	−0.14 (0.02) ***
Interest in ICT	0.23 (0.02) ***	0.41 (0.03) ***
Random effects	***Variance component***	***Variance component***
Residual variance	0.772 (0.003)	0.757 (0.007)
Intercept variance	0.059 (0.014)	0.007 (0.007)
Explained proportion of variance		
At the student level	0.069	0.233
At the school level	0.011	0.451

*p < 0.05 **p < 0.01 ***p < 0.001

in ICT and the use of ICT for school purposes ($r = 0.195$) and even higher connection between interest in ICT and the use of ICT for leisure activities ($r = 0.406$).

In relation to our investigation of relationships between the individual variables, we next approached the modelling itself. Within the first research question, models with gender and interest in ICT as independent variables were created for every dependent variable. The resulting models for both dependent variables are stated in Table 5.3. The results in Table 5.3 show that while interest in ICT was a statistically significant factor both in connection to the use of ICT for school purposes and in connection to the use in leisure activities, gender is statistically significant only in ICT use in leisure activities. However, in the ICT use outside of school for school-related activities such as homework, the differences between boys and girls do not appear to be statistically significant.

We used effect coding for the gender variable, in which the girls were coded with number 1 and boys with −1. Regression coefficients for gender thus state how much lower or higher the ICT use is in girls in comparison to an "average" student. To say by how much the use differs between boys and girls, it is necessary to multiply the coefficient by two. A statistically significant negative coefficient thus shows that girls use ICT in leisure activities by 0.14 less than average and by 0.28 less than boys. The regression coefficient for interest in ICT states how much the use of ICT will increase or decrease if the interest in ICT increases by one degree. A statistically significant positive coefficient thus states that higher interest in ICT is connected to a higher degree of use of ICT.

5.3 The Effects of Family Background Characteristics on Student Use of ICT

Within the second research question, we shifted our attention to variables that concern the socioeconomic characteristics of student families. Here we followed the previous models and added the three independent variables that concern three basic

Table 5.4 Regression coefficients for student use of ICT as dependent variables, and parental occupation, parental education, and home possessions as additional independent variables

	ICT use for school purposes	ICT use for leisure activities
Fixed effects	***Coefficients (SE)***	***Coefficients (SE)***
(Intercept)	0.06 (0.10)	0.31 (0.10) **
Gender		−0.14 (0.02) ***
Interest in ICT	0.21 (0.02) ***	0.39 (0.02) ***
Parental occupation	<0.01 (<0.01)	<0.01 (<0.01)
Parental education	<0.01 (0.01)	−0.01 (0.01)
Home possessions	0.12 (0.03) ***	0.03 (0.02)
Random effects	***Variance component***	***Variance component***
Residual variance	0.730 (0.003)	0.689 (0.007)
Intercept variance	0.057 (0.015)	0.010 (0.009)
Explained proportion of variance		
At the student level	0.073	0.231
At the school level	0.025	0.412

*p < 0.05 **p < 0.01 ***p < 0.001

components of socioeconomic status: parental occupation, parental education, and home possessions. We retained only the statistically significant predictors from the previous models, i.e. only the interest in ICT for ICT use for school purposes, and both gender and interest in ICT for ICT use in their free time. The results of the models are summarized in Table 5.4. The results indicate that only one of the three components of socioeconomic status is relevant in connection to ICT use: home possessions. Neither the parental occupation nor the parental education showed a statistically significant connection to the ICT use outside of school. Home possessions seem to be significant only in connection to ICT use for school activities, but not for leisure activities.

Given that only the home possessions variable was revealed to be relevant within the socioeconomic family characteristics, we decided to further investigate which aspects of the home possessions play the most important role. We used four variables concerning various aspects of home possessions instead of one general variable for home possessions: family wealth, cultural possessions at home, home educational resources, and ICT resources at home. The results of models containing these four variables and the previously identified significant predictors (gender and interest in ICT) are summarized in Table 5.5.

Table 5.5 shows that from all four types of home possessions, only the home educational resources are statistically significant. Perhaps rather surprisingly, the connection to the ICT availability (i.e. ICT resources at home) does not appear to be significant. It seems that for the use of digital technologies in the home environment for school-related activities, it is more important whether the students have good conditions for studying and preparing for school, including the availability of a computer for school purposes, which is one of the items in the home educational resources index, than the availability of a wide spectrum of different digital

Table 5.5 Regression coefficients for student use of ICT as dependent variables and family wealth, cultural possessions, home educational resources, and ICT resources as additional independent variables

	ICT use for school purposes	ICT use for leisure activities
Fixed effects	***Coefficients (SE)***	***Coefficients (SE)***
(Intercept)	−0.03 (0.03)	0.09 (0.02) ***
Gender		−0.14 (0.02) ***
Interest in ICT	0.23 (0.02) ***	0.41 (0.03) ***
Family wealth	0.02 (0.03)	−0.01 (0.03)
Cultural possessions	0.02 (0.02)	−0.02 (0.01)
Home educational resources	0.14 (0.02) ***	0.06 (0.02) **
ICT resources at home	<0.01 (0.03)	0.05 (0.03)
Random effects	***Variance component***	***Variance component***
Residual variance	0.746 (0.003)	0.735 (0.007)
Intercept variance	0.061 (0.014)	0.010 (0.009)
Explained proportion of variance		
At the student level	0.094	0.241
At the school level	0.043	0.404

*p < 0.05 **p < 0.01 ***p < 0.001

technologies, which corresponds with the ICT resources at home index. Interestingly, the home educational resources variable appears to be statistically significant even in connection to ICT use in leisure activities. However, a stronger connection can be seen between home educational resources and the use of ICT for school-related activities than with ICT use in their free time.

5.4 The Effect of ICT Use at School on ICT Use Outside of School

In connection to the third research question, we enriched the existing models with variables concerning the use of ICT at school. The consideration that if the students use ICT to a large extent in the school environment, this might cause a more frequent use of digital technologies outside the school environment and in their free time was the general hypothesis behind monitoring the relationship between the use of ICT in school and the use of ICT outside of the school environment, regardless of whether its use was for school-related or leisure activities. We added three different variables regarding the use of ICT in school into the existing models. The first variable concerns the use of ICT in school in general; the other two variables concerned subject-related ICT use, i.e. the students expressed their opinions on ICT use always in connection to a specific subject (Czech language, foreign language, mathematics, etc.). In the subject-related ICT use, we further distinguished between the subject-related ICT use during lessons and the subject-related ICT use outside of lessons. The ICT use during lessons variable was created on the basis of items

Table 5.6 Regression coefficients for student use of ICT as dependent variables and use of ICT at school in general, subject-related ICT use during lessons and subject-related ICT use outside of lessons as additional independent variables

	ICT use for school purposes	ICT use for leisure activities
Fixed effects	***Coefficients (SE)***	***Coefficients (SE)***
(Intercept)	−0.08 (0.02) ***	0.07 (0.02) ***
Gender		−0.14 (0.02) ***
Interest in ICT	0.12 (0.02) ***	0.35 (0.02) ***
Home educational resources	0.12 (0.02) ***	0.05 (0.02) *
ICT use at school in general	0.44 (0.03) ***	0.27 (0.02) ***
ICT use during lessons	−0.01 (0.02)	−0.02 (0.02)
ICT use outside of lessons	0.08 (0.02) ***	0.04 (0.02) *
Random effects	***Variance component***	***Variance component***
Residual variance	0.574 (0.005)	0.647 (0.006)
Intercept variance	0.013 (0.006)	0.005 (0.006)
Explained proportion of variance		
At the student level	0.356	0.327
At the school level	0.679	0.774

*p < 0.05 **p < 0.01 ***p < 0.001

monitoring whether the teacher or students used an electronic device in the individual lessons during the last month. The ICT use outside of lessons variable was created on the basis of items in which the students stated how much time they spend using electronic devices outside of class during an average school week.

The results of models for both dependent variables are listed in Table 5.6. The ICT use in school in general is the strongest predictor of the use of ICT by adolescents either for school purposes or in their free time. On the other hand, the use of digital technologies directly in lessons does not seem to be statistically significant in relation to the use of digital technologies for leisure activities nor in the home use of digital technologies for school purposes. The subject-related use of digital technologies outside of lessons appears in both models as a statistically significant factor, but the strength of the connection is much lower than in the general ICT use in school. In both the ICT use at school in general variable and the ICT use outside of lessons variable, the result is a positive connection to the use of ICT outside of school. Thus it applies that the general use of ICT in school and subject-related use of digital technologies outside of class is related to the use of digital technologies by adolescents in their leisure time and in the course of performing their school duties in the home environment.

5.5 The Role of Peers in the Use of Digital Technologies by Young People

In the last building phase of the model of the use of digital technologies by adolescents, we focused on the context of peers. Specifically, we focused on the variable quantifying the degree to which digital technologies are a part of everyday

Table 5.7 Regression coefficients for student use of ICT as dependent variables and ICT in social interaction as the additional independent variable

	ICT use for school purposes	ICT use for leisure activities
Fixed effects	***Coefficients (SE)***	***Coefficients (SE)***
(Intercept)	−0.06 (0.02) **	0.10 (0.02) ***
Gender		−0.08 (0.02) ***
Interest in ICT	0.07 (0.02) **	0.28 (0.02) ***
Home educational resources	0.12 (0.02) ***	0.03 (0.02)
ICT use at school in general	0.41 (0.03) ***	0.24 (0.02) ***
ICT use outside of lessons	0.07 (0.02) ***	0.03 (0.02)
ICT in social interaction with peers	0.13 (0.02) ***	0.20 (0.02) ***
Random effects	***Variance component***	***Variance component***
Residual variance	0.569 (0.005)	0.638 (0.005)
Intercept variance	0.015 (0.007)	0.004 (0.005)
Explained proportion of variance		
At the student level	0.367	0.357
At the school level	0.642	0.822

*p < 0.05 **p < 0.01 ***p < 0.001

interaction of adolescents with their peers (i.e. ICT in social interaction). We were interested in whether adolescents who talk to their peers about digital technologies or who use digital technologies to communicate with their peers generally use the digital technologies more frequently or to a higher degree.

The results of both final models are available in Table 5.7, which shows that the ICT in social interaction variable manifests as a statistically significant factor in both models. Thus it seems that the peer interaction concerning ICT or taking place via ICT leads not only to a greater extent of the use of digital technologies in their free time, but also to a more frequent use of digital technologies in performing school duties in the home environment (homework etc.). In the model of ICT use for leisure activities, adding the ICT in social interaction variable caused other variables to no longer appear as statistically significant factors: home educational resources and subject-related use of digital technologies outside of lessons. This is probably caused by a certain degree of shared variance between these variables. In connection to the use of digital technologies by adolescents for leisure activities, primarily gender, interest in ICT, general use of ICT in school, and ICT in everyday social interaction with peers can be considered the most important factors.

5.6 Conclusion

The goal of this chapter was to investigate the differences in the use of digital technologies by fifteen-year-old students in relation to selected variables classified into the following four basic areas or contexts: personality characteristics and

preferences of the adolescents, family characteristics related to socioeconomic status, school characteristics related to the use of ICT, and social interaction with peers. These differences, specifically the relationships between these variables, were the subject of our interest with regard to the use of digital technologies in the home environment, both for leisure activities and for school-related purposes. In order to meet our set goal, we used data for the Czech Republic acquired within the PISA 2018 research and we performed a multi-level regression analysis, by which we were able to acquire answers to the four main research questions we asked ourselves in this research.

Within the first research question, we focused on gender and the interest in digital technologies and we investigated the degree to which gender and interest in ICT associated with the use of digital technologies by adolescents in the course of leisure activities and in school-related activities performed outside of school. The results of the analyses showed that girls use digital technologies statistically significantly less than boys, but only in the context of leisure activities. In the use of digital technologies for school-related activities like homework and school projects in the home environment, there is no difference in the degree of use of digital technologies between boys and girls. Thus it seems that the occasionally contradictory results in the existing research focusing on the role of gender in connection to the ICT use (comp. for example Aesaert & van Braak, 2015; Drabowicz, 2014; Scherer et al., 2017) can probably be explained to a certain extent by whether the use of digital technologies concerns their free time or the performance of school duties. The use of digital technologies outside of school is also significantly connected to the interest in digital technologies, both in their use for entertainment and for school-related activities. The presumed relationship stating that adolescents with general interest in digital technologies tend to use them to a larger degree than adolescents with smaller interest in digital technologies thus applies. However, this relationship is several times larger in the use of digital technologies in leisure activities than in the use of digital technologies outside of school, but for school-related purposes.

The family context and its influence upon the use of digital technologies by fifteen-year-old students is the second area of focus in this chapter. We focused on partial indicators of the socioeconomic status within the family background. In the first step, we started by focusing on the parental occupation, parental education, and home possessions. In the second step, we distinguished various aspects of home possessions in more detail. Specifically, these concerned family wealth, cultural possessions, home educational resources, and ICT resources. The results of the performed analyses showed that home possessions, specifically and exclusively home educational resources, are primarily related to the use of digital technologies by adolescents in the home environment. At the same time, a significant connection is visible only in connection to the use of digital technologies for school purposes, while the connection to the ICT use in their free time was not proven to be relevant. Thus it seems that as regards the use of digital technologies by adolescents in leisure activities and for entertainment, there are no significant differences given by the occupation and education of parents or by home possessions and equipment. This can be considered surprising to a certain degree, because some studies (for example

Chaudron et al., 2018; Livingstone et al., 2015) considered these family-related factors important and relevant in explaining the differences in the use of digital technologies by children.

After the personality and family characteristics, we focused on the context of school. On the basis of the existing studies, we presumed that the use of digital technologies in the school environment could affect how the adolescents themselves use digital technologies outside of school. Our presumption was only partially confirmed. While in the general use of ICT in school, a statistically significant connection to the use of ICT outside of school was discovered, in the use of digital technologies directly in class, no connection to the use of digital technologies outside of school was found. Thus, it seems that the use of digital technologies directly in class does not lead to the students using digital technologies to a larger extent outside of school. On the contrary, the general use of digital technologies in school, including the use of digital technologies during recess or for communication with classmates is related to the use of digital technologies outside of school. It can be presumed that this is due to the fact that this variable encompasses various other forms of informal use of digital technologies or generally the use of ICT with peers in school, which does not end at the end of the lesson or the school day, but which naturally moves to the out-of-school environment. On the other hand, the use of ICT directly in lessons is probably often only of a formal character and so it usually ends at the end of the given lesson. The subject-related use of digital technologies outside of class, which probably has a more formal character than the general use of digital technologies in school, has a statistically significant connection to the use of ICT by adolescents for school-related purposes in the home environment.

The area of peers was the last area we considered in connection to the use of digital technologies by adolescents. In this area, we focused on whether the degree or frequency of the use of digital technologies by adolescents reflects their everyday interactions with their peers, and especially such interactions, such as conversations, that concerned digital technologies in some way. The results of the analyses showed that digitally mediated interactions and technology-focused interactions[1] with peers truly do have a significant influence on the degree of use of digital technologies by adolescents both in their free time and for school-related purposes in the home environment. The more the digital technologies are a topic of discussions between peers, and the more that peers use digital technologies in mutual interactions, the more the digital technologies are used by adolescents in their free time and also for school-related purposes.

These results add another point of view to the existing findings presented in the previous chapters. At the same time, they open a space for a more detailed mapping of the fields that are the subject of the next chapters. As regards to the previous chapters, the parallels most visible are those with Chap. 3, which focused on teachers and the use of digital technologies in schools. In Chap. 3, we pointed out

[1] In this case, we refer to a variable that concerns the interactions mediated by technologies (i.e. performed through technologies), and also generally interactions that concern technologies (for example, when adolescents speak face-to-face about digital technologies with their friends).

a certain ambivalent relationship between digital technologies and the school environment that can be seen to a certain extent in the results of this chapter. It seems that the school environment plays a certain role in the manner and degree of use of digital technologies by students outside of school; on the other hand, it shows that the more important roles are played by various forms of informal use of digital technologies in the school environment, including the use of digital technologies with peers during recess. The use of digital technologies directly in lessons does not seem to impact the use of digital technologies by adolescents outside the school environment. This may be due in part to the fact that in Czech schools, teachers use digital technologies in a rather limited way and primarily to support the traditional approaches to teaching, as shown in Chap. 3. Thus it is possible that directly within lessons, Czech students do not really learn to work with digital technologies in manners usable outside of the lesson itself or even in leisure activities. Thus the more frequent use of digital technologies in the class very often does not lead to a more frequent use of digital technologies by students in the environment outside of school.

The analyses performed in this chapter provided interesting findings, especially with regard to the relation between the family environment and the use of digital technologies by adolescents. We also consider the results suggesting that the education of the parents or the degree of availability of digital technology in the home do not seem to directly lead to differing use of digital technologies by children, especially in connection to the use of digital technologies in their free time to be very interesting and surprising to a certain degree. At the same time, the family and home environment can be considered a primary context within which children encounter digital technologies (Nathanson, 2015), and this primary context may differ across families. This applies both with regard to the available digital technologies and the parents' approach to digital technologies or with regard to the strategies the parents use to regulate the use of digital technologies by their children. Thus it is necessary to pay more detailed attention to the family and family environment to discover the relevant factors explaining the results in the use of digital technologies by children and adolescents from different families. Chapter 6 focuses on the family environment and primarily on the parents and their approach to digital technologies.

The results of this chapter provided a certain insight into how the use of ICT by Czech adolescents differs on the basis of their gender, general interest in digital technologies, and the use of digital technologies for interaction with peers. Even here, we encountered the understandable limits given by the quantitatively oriented approach selected in this chapter. On the basis of the performed analyses, we are unable to distinguish in more detail how adolescents use digital technologies outside of school or in their free time, within which specific activities the digital technologies are used by adolescents, what leads them to these uses of ICT, and what specific role in the use of digital technologies by adolescents do their peers and activities performed together with peers play. We have also used a qualitative approach, the main results of which are presented in Chap. 8, for a detailed insight into the life of Czech adolescents with digital technologies.

Appendix

Table 5.8 Correlation matrix of the variables used in the analysis

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1. ICT use for school purposes	1													
2. ICT use for leisure activities	0.451 ***	1												
3. Interest in ICT	0.195 ***	0.406 ***	1											
4. Parental occupation	<0.001	−0.045 *	−0.038 *	1										
5. Parental education	0.005	−0.049 *	−0.042 *	0.434 ***	1									
6. Home possessions	0.101 ***	0.008	−0.002	0.374 ***	0.317 ***	1								
7. Family wealth	0.064 ***	0.042 *	0.056 **	0.228 ***	0.185 ***	0.730 ***	1							
8. Cultural possessions	0.067 **	−0.024	−0.046 **	0.333 ***	0.276 ***	0.768 ***	0.235 ***	1						
9. Educational resources	0.163 ***	0.059 **	0.018	0.150 ***	0.130 ***	0.510 ***	0.216 ***	0.333 ***	1					
10. ICT resources	0.091 ***	0.059 **	0.085 ***	0.249 ***	0.206 ***	0.694 ***	0.777 ***	0.281 ***	0.346 ***	1				
11. ICT use in school in general	0.499 ***	0.357 ***	0.201 ***	−0.031	−0.014	0.057 **	0.092 ***	−0.003	0.090 ***	0.085 ***	1			
12. ICT use during lessons	0.122 ***	0.070 ***	0.072 ***	−0.031	−0.018	0.037 *	0.065 ***	0.012	−0.004	0.052 ***	0.196 ***	1		
13. ICT use outside of lessons	0.184 ***	0.103 ***	0.049 *	−0.015	−0.004	0.011	0.019	−0.001	0.022	0.030	0.194 ***	0.379 ***	1	
14. ICT in social interaction	0.272 ***	0.401 ***	0.400 ***	−0.058 ***	−0.083 ***	−0.008	0.046 **	−0.042 *	0.054 ***	0.046 **	0.260 ***	0.077 ***	0.095 ***	1

*p < 0.05 **p < 0.01 ***p < 0.001

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Chapter 6
Parental Approaches to Digital Technologies

Abstract This chapter presents another important context of contemporary adolescent life – family and the home environment. Young people spend a large part of their time in this environment, where they encounter digital technologies in various situations and contexts. In the family environment, generations meet that grew up in different times and have diverse experiences with digital technologies. The parents usually represent a generation that grew up when access to digital technologies was not common at home nor in school. However, today's young people live in times when digital technologies are a natural part of their lives. The first part of this chapter presents theoretical views on digital technologies in the lives of young people and adults and on generational conflicts. We focus on the family environment, the primary social context within which children encounter digital technologies. Parental regulatory strategies directing the use of digital technologies by children are another important topic. We also pay attention to how adolescents view parental regulations.

The next part of the chapter presents the results of our research and looks in more detail into the everyday lives of several Czech families to describe and explain how digital technologies permeate their lives, how the parents view digital technologies, and how the adolescents use the digital technologies in their free time and in their learning. We focus on how the rules for the use of digital technologies by adolescents are set in the families. These rules create frameworks for the use of ICT in various activities. We present the categories common for all the investigated families, then we gradually present three types of digital generation gaps identified in the investigated families and the characteristics of these gap types.

Keywords Parents · Home · Family · Digital technologies · Generation gap · Learning · Free time · Rules · Parental mediation

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6.1 Theoretical Background

Today's adolescents were born when digital technologies were generally widespread and available. These technologies play an important role in all fields of life in developed countries. Digital technologies have formed an integral part of young people's lives since early childhood (Danby et al., 2018). Designations such as *cyberkids* (Holloway & Valentine, 2003), *net generation* (Oblinger & Oblinger, 2005; Tapscott, 2009), *e-generation* (Underwood & Farrington-Flint, 2015), *app generation* (Gardner & Davis, 2014), *Google Generation* (Rowlands et al., 2008), *millennials* or *new millennium learners* (Pedró, 2007), *digital youth* (Itō, 2009), *learners of the digital era* (Gallardo Echenique, 2015) and even the somewhat odd designation of *Generation Einstein* (Boschma & Groen, 2006) all became an accepted terms for present-day children and young people.

However, many parents who grew up at times when digital technologies were practically inaccessible or only "entered" their lives gradually are in a different situation. Several authors have considered whether and how the generations of parents and children differ because of the current omnipresence of digital technologies. Some authors have concluded that digital technologies may have caused a fundamental shift in society and thus they are a source of significant differences between generations (Prensky, 2001a, b; Palfrey & Gasser, 2008; Tapscott, 2009); these authors have been criticized for unclear research methodology and excessive generalization, in which certain properties and abilities are attributed to entire generations (Erstad, 2010).

Other authors have argued that individual generations cannot be distinguished from each other in such a radical manner (Bennett et al., 2008; Ellis & Goodyear, 2010). Buckingham (2007) wrote that the "digital generation" is a stereotype that belies the considerable difficulties and frustrations that children (like adults) often experience in their dealings with new media. Defining a generation through its relationship to a certain technology also carries a danger of overestimating the role of the given technology without considering the context of social, economic, and political developments (Buckingham & Willett, 2006). Selwyn (2009) stated:

> Whilst some studies may highlight instances of spectacular digital practices by some young people in some circumstances, more commonly a picture of rather less spectacular technology use and engagement emerges from the empirical literature. In this respect, young people's engagements with digital technology appear to be as varied as any other aspect of their lives (pp. 373–374).

The topic of digital technologies in the lives of children and young people has been the subject of numerous empirical studies that tried to determine whether digital natives truly "exist" and possess the properties Prensky (2009) and other authors claimed (Bennett et al., 2008; Bennett & Maton, 2010; Bittman et al., 2011; Thomas, 2011). In 2009, Prensky amended his assertions, writing that the division into digital natives and digital immigrants was starting to lose its meaning and he was starting to consider the term *digital wisdom*, which he defined as "referring both to wisdom arising from the use of digital technology to access cognitive power beyond our

innate capacity and to wisdom in the prudent use of technology to enhance our capabilities" (Prensky, 2009, p. 1). Palfrey and Gasser (2011) followed Prensky's original opinions when they noted that this was not a gap between generations, but rather "gradients of diverse usage patterns" (Palfrey & Gasser, 2011, p. 188).

These "later" (and less radical) contemplations, together with other studies (Jukes et al., 2010; Kirschner & De Bruyckere, 2017), are an inspiration for thinking about the topic of digital technologies in the lives of children, parents, and families. The opinions of these authors motivated our research and our search for the answer to the question of how to view various approaches toward the use of digital technologies by various groups of people growing up in different periods of time. The challenge remains of how to avoid inadequate generalizations, to not succumb to social or technological determinism, and to remember the complexity of the relationship between humans and digital technologies (López et al., 2015). This means not focusing on digital technologies as a tool of revolutionary changes in people's lives but seeing them as products of a certain society and culture (Lévy, 2000). We are not trying to evaluate the impacts of digital technologies on people, but to focus on the manners and goals of using digital technologies by people in their lives. We are convinced that the digital technologies and the age of an individual cannot be the single determining factors separating whole generations. In the end, both children and adults always use contemporary digital technologies, albeit differently (Buckingham & Willett, 2006).

In the search for answers to our questions, we can rather paradoxically draw inspiration from thoughts formed before the time of digital technology. Karl Mannheim focused on the problems of generations in his work at the end of the 1920s. According to Mannheim and Kecskemeti (1964), a generation consists of individuals born in the same time period in a certain historical-social space. In other words, these are individuals born in the same historical period and cultural space who live through the same contemporary topics. Being a part of a certain generation then includes a tendency to certain ways of acting, feeling, and thinking. At the same time, this affiliation with a certain generation significantly limits the number of possible ways and types of experiencing, thinking, feeling, and acting and it limits the space for manifestations of individuality (Mannheim, 2007).

Formative experiences from childhood create a basis for one's natural image of the world. Thus when perceiving an event and determining its relevance, a critical factor is whether it is experienced by an individual who processes it as a fundamental and formative impression from their youth, or by someone who experiences it at a more advanced age. Even though older generations experience some historical events at the same time as younger generations, they perceive them and reflect on them in a different way. Older people live in a specific useable past experience, through which every new possible experience acquires an appearance and place in advance. In young people, the formative powers are still being established and the perception of new situations is not so affected by previous experiences (Mannheim & Kecskemeti, 1964). New experiences are still becoming the "building blocks" of their image of the world.

The Mannheim concept provides a wide framework for considerations about the relationship of adolescents and their parents or even grandparents to digital technologies. The generation of parents was formed by experiences different from those of the generation of their children and digital technologies did not play a fundamental role in the acquisition of life experiences for most parents. For some parents, digital technologies were not part of their childhood games, their leisure time activities, or their school education. To a certain extent, these experiences from youth form the ways in which adults perceive digital technologies in their own personal lives (Zounek, 2008) and also in the lives of their children. For many parents, this can represent a source of insecurity in upbringing, because the digital world represents a rather unknown territory (Plowman et al., 2010; OECD, 2019). However, this does not mean that all parents are less skilled in the use of digital technologies than their children; for many adults, digital technologies have become an important part of their job or profession. Therefore, they may be very skilled users of digital technologies and have extensive knowledge in the field of digital technologies. In the end, digital technologies have also entered the formal education and informal (lifelong) education of adults (Selwyn et al., 2006; Straková & Veselý, 2013). Parental approaches to digital technologies are thus affected by experiences from work and by the general discourse concerning the digital technologies within the society. Parents can perceive digital technologies in the household as a work tool or a modern learning tool, a source of information, or an investment into the future of their children (Holloway & Valentine, 2003; Horst, 2010; Underwood & Farrington-Flint, 2015). A utilitarian approach to digital technologies is not exceptional among parents, especially for mobile phones, which are used for control and communication with children travelling to and from school or leisure groups (Pasquier, 2008).

In adolescents, the situation is completely different. They grow up with digital technologies that participate significantly in the formation of their natural image of the world. Young people consider digital technologies a completely normal means of communicating with their peers (Venter, 2017) and use them as a tool for forming and reforming their online identity and self-presentation (Subrahmanyam & Šmahel, 2010). For adolescents, digital technologies often constitute a part of their free time both with their friends and independently. In contrast to their parents, adolescents tend to focus on the present instead of on their future. They also do not think very much about the role of digital technologies in their future life or work. They prefer using digital technologies for fun over using digital technologies as purely utilitarian tools for school purposes (Hagen, 2007; Holloway & Valentine, 2003).

More and more digital technologies enter the everyday lives of adolescents and their parents. At the same time, some (digital) technologies are gradually disappearing from their lives. This can affect everyday life, means of communication, and the formation of social reality, in which both the new and the "disappearing" digital technologies represent an important constitutive element. Adults may react to these changes differently than children. Buckingham mentioned a "generation gap" that appears as "a consequence of adult fears about the escalating pace of social change, and their anxieties about a loss of continuity with the past" (2006, p. 1). With regard to the importance of digital technologies in individual lives, the term digital

generation gap can be, as also defined by Bennett and Corrin (2018), a "proposed gap between children and adults (especially parents and teachers) due to young people's natural ability to adapt to new technologies more successfully than older generations."

The fact that parents and children perceive and use digital technologies in different ways does not necessarily mean that digital technologies represent a gap only between the adults and children. Clark (2011) wrote that ICT offers options for interconnecting generations, because digital technologies can be used in many joint activities, including communication between members of a household, dealing with various life situations, such as planning joint vacations, and leisure activities. The question is how the imaginary bridge between generations (possibly created by ICT) will be built by children and parents, how they will or will not use it, and how it will "surpass" the borders of its own generational "culture."

The dynamics of the development and availability of digital technologies are reflected in individual lives and in family live. While in the past, the television was the center of the household, typically placed in some central space of the household where families spent their time together, the arrival of mobile technologies has "moved" their use more and more into individual rooms, including children's rooms. The term *bedroom culture*, which describes the "privatization" of digital technologies in family life, is used in connection with this pattern (Kraus, 2015; Livingstone, 2007; Steele & Brown, 1995). Livingstone and Sefton-Green (2016) wrote about families who "live together, but separately" (p. 244), to describe the individual use of digital technologies by household members in separate spaces of the home. Van Rompaey and Roe (2001) even noted the division of family life into separate "compartments" (compartmentalization of family life), asserting that this is not caused by the digital technologies alone, but by the organization of family life that allows the physical separation of household members, supported by the architecture of present-day homes. The children thus achieve greater independence and autonomy within family life and the children's rooms represent a "private space" (Lincoln, 2012). Pasquier (2008) wrote about the "spatial autonomy" of children that is developing gradually, especially in the second half of the twentieth century. The children's rooms thus become a specific children's world, expressed through specific cultural products and equipment. With digital technologies in children's rooms, children can govern and control their media world themselves to a great extent (Horst, 2010), which can be a very important experience. The result of a simultaneously increased greater spatial autonomy of children and the presence of ICT in children's room is an interesting paradox. Children are much more welcome in their parents' rooms than parents are in the children's rooms (Pasquier, 2008).

Despite all the transformations of both family life and society, it is parents who introduce children into the world of the media. The family environment is the primary social context within which children encounter digital technologies (Horst, 2010). Parents affect the children's approach to digital technologies, the manner in which they use the digital technologies, and the relationship the children form with them (Nathanson, 2015). Parents affect children both intentionally and unintentionally (Vaala & Bleakley, 2015). They may affect intentionally children through

various kinds of regulations; unintentionally, as children watch their parents during their everyday use of digital technologies, children may adopt some of their procedures or manners of use of ICT.

The search for a balance between care and control or possibly between autonomy and dependence is an important topic in the relationship between children and their parents. This can represent a rather significant dilemma for the parents (Hagen, 2007). On one hand, the parents support their children by giving them access to digital technologies, by being able to control the digital technologies, and by using them for learning and development. On the other hand, there's easy access by children or adolescents to inappropriate content on the Internet, the risk of cyberbullying, and even some health risks (Cernikova et al., 2018; Daneback et al., 2018; Subrahmanyam & Šmahel, 2010). Children are dependent on their parents in many cases in terms of digital technologies, because parents equip the household with digital technologies, mediate the access to digital technologies to the children, help them in their first steps in controlling digital technologies, etc. (Nathanson, 2015). At the same time, children like to discover the world of digital technologies on their own as well using the trial and error method (Chaudron et al., 2018), which requires a certain degree of autonomy. However, parents thereby partially lose control over what children do with digital technologies and how they do it. The parents use various strategies to allow them to direct the use of digital technologies by children.

The topic of parental mediation strategies has been the subject of a number of expert studies focusing on various age groups of children and adolescents and investigating the problems from the viewpoint of both adults and children (Clark, 2011; Chaudron et al., 2018; Haddon, 2015; Hiniker et al., 2016; Smahelova et al., 2017; Vaala & Bleakley, 2015). There is no single generally accepted delimitation of parental mediation in specialized literature. However, in compliance with Livingstone and Helsper (2008), we can generally define it as: "the parental management of the relation between children and media" (p. 581). Many studies focused on mediation strategies are oriented on the negative effects of the media on young people, and many studies concern television. Clark (2011) noted that there are also positive ways that parents can mitigate the negative effects of the media that can affect other factors in a young person's environment. Mediation can also play an important role in the socialization of children in the world of digital technologies and in society as well. The scientific literature (Clark, 2011; Livingstone & Helsper, 2008; Nikken & Schols, 2015; Valkenburg et al., 1999, 2013) present three basic strategies of parental mediation that originated in studies focused on television. Active mediation is based on discussions with young people regarding the content of media reports they viewed. Restrictive mediation primarily uses regulations and rules determining the use of digital technologies. The strategy "co-viewing" involves parents watching television together with their children.

Even though the information from the studies of parental mediation of television can be used in the field of digital media as well, some studies have focused specifically on digital media or the Internet, thus developing the mediation theory with other strategies that better reflect the properties of digital technologies. Livingstone and Helsper (2008) wrote about four basic mediation types:

1. *Active co-use* is partially similar to active mediation, but in comparison to watching television, it is better adapted to the interactive nature of the Internet. Parents sit at the computer with their children and watch the children's activity on the Internet and talk about their online activities, but also provide advice or recommendations. This strategy can also contain restrictions, such as prohibiting giving personal information on the Internet.
2. *The interaction-restriction* lies in limitations or restrictions of contact with other people via digital technologies and their services (various communication platforms – Discord, Instagram etc.).
3. *Technical restrictions* are focused on limitations or restrictions in the field of installation of computer programs, but also on limiting access to some websites. This can also concern limitations of connections to the home wireless network.
4. *Parental monitoring* is based on parental inspection after the children finish their activities on the Internet, either openly or secretly (Livingstone & Helsper, 2008; Smahelova et al., 2017).

Chaudron et al. (2018) mentioned another strategy, referred to as *active distraction*, in which the parents try to provide the children with attractive off-line activities. However, parental mediation or regulation is discussed primarily within the meaning of alleviating the negative effects of the media, with significantly less attention paid to the fact that all of these strategies contain elements of informal learning. In addition, the parents are examples to the children, both knowingly and unknowingly. Within this context, Clark (2011) deliberated on the topic of situated learning and especially participatory learning, which is close to active mediation, specifically the active co-use strategy. The participation process supports mutual learning (Domínguez, 2012), during which parents cooperate with children, learn together, and remove the traditional model of a parent in which the parent is the exclusive authority and within learning, the transmission of knowledge is performed primarily from parents to children. There is also "reverse socialization," in which the parents are socialized into the world of new media by their children (Hoikkala, 2004 in Buckingham & Willett, 2006).

Time spent together with digital technologies can support communication among family members and strengthen family bonds, but digital technologies can also be a source of entertainment for the entire family, such as in playing games. Digital technologies can also help maintain contact among family members living far apart. On the other hand, parents who lack knowledge and skills in the field of digital technologies may perceive digital technologies as an element interfering with their status as a (good) parent or they may feel a loss of control over the upbringing of their children. This can be a source of fear of digital technologies (Holloway & Valentine, 2003). Some parents may thus "fight" digital technologies in the upbringing of their children, especially if they feel that it leads the children away from one of their main activities – learning (Horst, 2010). It is clear that digital technologies in families may be considered both a distractive element and a tool of harmony (Clark, 2011; Padilla-Walker et al., 2012).

How the children or adolescents perceive parental mediations and how they react to them is important. Children's reactions can be divided into two predictable groups. The first group reacts positively and internalizes the rules defined by their parents. The second group includes those who reject the rules or who are opposed to parental mediations, with the given "limitations" producing various negative emotional reactions. For disagreements regarding the rules, it may happen that children accept the rules, but they are unhappy or angry (Hagen, 2007). Haddon (2015) stated some factors that can affect the children's reaction to the parental rules or mediation strategies. The age of the child is important, since older children or adolescents may tend to oppose or reject regulations, because they expect more independence, autonomy, privacy, and trust from their parents. The manner in which the parental regulations are formulated and explained also has an impact upon their acceptance/rejection. An important role can also be played by the manner in which the restrictions are communicated to the children, or, in other words, how sensitively the parents proceed with regard to the situation and the context.

The themes and results of previous studies have served as a starting point for our research. The goal of this chapter is to further describe and understand how the presence of digital technologies manifests in Czech families with adolescents.[1]

Specifically, we focus on these questions:

- How are digital technologies perceived in families?
- How are digital technologies used in families?
- How are rules established for the adolescent use of digital technologies in families?

We acquired the answers to these questions in an analysis of semi-structured interviews conducted with parents of fifteen-year-olds and the adolescents themselves. The parents were born in the 1960s, 1970s, and 1980s in what was then socialist Czechoslovakia, that is, practically without contact with contemporary state-of-the-art digital technologies. We noted the placement of digital technologies in the household or in the children's rooms. In some cases, the parents and children described and explained the spatial arrangement of digital technologies in the household. All of the transcribed interviews were open-coded (Flick, 2009; Charmaz, 2006) and three basic categories were made from the created codes on the basis of similarity of topics:

- parental ideas about the manner in which their children spend their free time and prepare for school;
- competition for the dominance of the parental and adolescent view of digital technologies;
- digital generation gap.

[1] Our research is focused on adolescents. In the text, we use the words child or children to indicate a parent-child (offspring) relationship. We also use the term child/children in the theoretical introduction, focused more generally on the topics of childhood/adolescence.

The digital generation gap category was dominant in our data. At the same time, it was clear that this gap manifested in various ways and to different extents in the families. A more detailed analysis of this category showed that the digital generation gap differs primarily in the following aspects in the individual families:

- parental approach to digital technologies
- parental mediation strategies
- adolescent strategies in responses to parental strategies
- manner of spending time together for parents and adolescents.

On the basis of another analysis, we have identified three types of families according to the manifestation of the digital generation gap: deepening, maintaining status quo, or crossing. Each of these types is presented on example of two families.

6.2 Parentals Idea of Their Children's Free Time and School Preparation

In our sample, the parents grew up when digital technologies were neither a part of regular family life nor a part of a school education. The parents thus clearly spent their childhood and adolescence completely differently from present-day adolescents (see Chap. 2). In the interviews, we therefore focused on what the parents think about how their children spend their free time and prepare for school, i.e. the areas significantly affected by digital technologies. The results of our analyses showed that the parents' youth without digital technologies has affected and strongly influenced their ideas:

> They all say it's because of the times. That back then, we had, I don't know, footballs and we played in front of the houses with footballs and they have this. (…) They go outside. They don't go outside that often. But everyone's on the phone anyway. When they're going somewhere with their gang, they're on the phone. They are making videos, taking photos. (Natalie's mother)

While the adolescents consider the use of digital technologies within their free time to be completely natural, the parents tend to only accept the uses that concern valuable content or meaning for the adolescent, such as games of knowledge. This is demonstrated by Jiri's father: "As regards the actual games, he doesn't have any killing games, no shooting, he only has games that I myself consider helpful in his development." Renata's mother saw the use of a computer for activities in which Renata learned something as positive: "She knows how to draw things on the computer and so on. Or she is learning to do so. I don't mind that. It's important that they don't play some stupid games or watch some complete bull." However, the parents are generally skeptical about watching videos on YouTube. They consider it a waste of time. In this regard, Renata's mother was an exception to the rule when she recognized that some videos by Czech YouTubers are meaningful and valuable in passing social values on to young people and trying to motivate

them to follow their civic duties in a fun way and in language they understand: "Now I remembered the elections. When some of the YouTubers really nicely pressured the young people to go vote. So, you know, when it is used in this way, why not?" (Renata's mother). However, like the other parents, Renata's mother believed that children spend too much time with digital technologies, and did not consider the time spent in this way to be meaningful. The parents chose to occupy the children with other activities, such as housework, in order to somehow "divert" them from digital technologies.

The examples clearly show that the parents tolerate the use of digital technologies by adolescents if they contain some valuable content, such as educational, knowledge, or strategic games. This also concerns videos in which the adolescents acquire new information or learn something. The original intention of our research was to discover more about the manner in which the adolescents prepare for education using digital technologies and how the parents view the use of digital technologies in schools. We asked the parents about this and soon made an interesting discovery. Almost all of the parents shared a tendency to support their children in preparing for school without digital technologies rather than with them. Some parents (as we show later in the text) even confiscated their children's mobile phones or turned off the wireless Internet during the period in which the children were supposed to prepare for school. They feared that the adolescents would use the digital technologies for reasons other than studying and that online communication with peers or playing games on the mobile phone would predominate. The parents tended to respond rather generally, and, as it was shown, not very informedly to our questions regarding the use of digital technologies in schools. For example, they did not have specific ideas of what the adolescents were taught with digital technologies in schools, as the statement by Renata's father proved: "Well I don't know, I think they only teach them to use Office and very briefly so, that's what I think. And I don't think that it has any effect." In preparation for school, the parents only mentioned that from time to time, their children were supposed to prepare a report and share it as a PowerPoint presentation. However, they complained that the children were not taught how to create a (proper) presentation, as demonstrated by Renata's mother:

> That's what I want to say, that I was a bit aghast, that they were supposed to do a classic report, you know, in the form of a presentation. So I kind of think that they had some lessons of those computers, but I think the teachers didn't know how to teach it. And they kind of learned those presentations on their own at home. They did know how to put it in a frame and so, what bullet points to use, but I think they really did not know how much they should put in the presentation. So as not to make it boring, and what should it look like. But I think they didn't learn this in the school, so they tried to make something. And I know that when for example the little ones did it, they just copied it all, and the paragraphs were all terrible and so on. So I helped the boys to fix it. And I know that it was something for geography, and the teacher, who is kind of burned out, he yelled at them that this is not what a presentation should look like.

Other parents in our sample said similar things. They believed that the teachers required the children to use digital technologies on a level for which they did

not prepare them in the school. The parents then felt that they were filling in for the teacher in this respect and they did not understand how digital technologies were taught in the school. The parents praised one thing in connection with the digital technologies and school: the electronic record book, thanks to which they knew about the activities and the class results of the adolescent. At any time, they could look at their children's grades and attendance, and communicate with the school:

M: The fact is, I have the electronic record card, I have downloaded the application and it's much easier. Before, I had to log in and it was all complicated. Now I just enter one password and I'm there. That's good.

F: It's very well thought out, and you can clearly see everything. Grades, attendance, and homework. (Natalie's parents)

This use of digital technologies supports parental surveillance of adolescents, which they appreciate, because it is an easy, quick, and up-to-date source of information.

Parents and adolescents do not share ideas about spending free time and preparing for school. Present-day adolescents use digital technologies completely regularly in both of these areas. On the other hand, parents prefer that they would spend free time and prepare for school without digital technologies. They would like to limit the use of digital technologies by their children to a bare minimum. This approach is formed primarily by parental fears of the negative effects of the use of digital technologies. They consider digital technologies "risky" for their children in several areas: waste of time; unproductively spent time; loss of contact with the real world; and online communication limits the development of social and communication competencies. However, the adolescents do not share their parent's views of these risks. The parents consider it necessary for their children to use digital technologies to an adequate extent, and they deem parental control or regulation necessary for this. They want to have control over the use of ICT by their children, which can in their view help prevent the negative impacts of digital technologies. Further, parents consider it beneficial for the digital technologies to be used in cases in which they can help a person in specific life situations, such as the use of maps on the phones or searching for timetables. According to the parents in our sample, the possibility to be in contact with their children (and to have them under control) when the children are travelling to their after-school groups or to sports practice is one of the greatest advantages of digital technologies. The parents were calmer knowing that if necessary, the children could reach out to them at any time. This was revealed to be the main motivation for purchasing the first mobile phone for their children, typically after the children started going to school, so at six years of age at the earliest and usually later. The adolescents thus received their first digital technologies "for safety reasons" and the possibility of using the mobile phone for learning was not even considered. However, that is rather understandable, because for the adolescents in our study this took place around 2010, when mobile technologies were not a common part of family life or school life.

6.3 Struggle for Generational Domination

The parents in our sample were "molded" by a certain historical period and a rather different cultural environment, even though it was in the same country. This may be one reason that they usually see negatives and risks first in connection to the use of digital technologies, especially with regard to the further development and life orientation of their children. However, adolescents view digital technologies as a part of their lives, and they often misunderstand the parental requests to avoid using digital technologies or the parental emphasis on their negative aspects. These different views of digital technologies are then a cause of minor or major stress in the families, especially when there is an effort to enforce one of these views. In some families, the stress transforms into a struggle about whose viewpoint of digital technologies will dominate.

It is only a slight exaggeration to say that both adolescents and parents use their abilities in this struggle to make their viewpoint predominate and thus to determine the rules and standards for the use of digital technologies in the entire household. Parental regulations, including prohibitions, threats, turning off wireless network connections, confiscating phones, time limits for digital technology use, and intentional efforts to occupy adolescents to prevent them from having time to use digital technologies are the most important parental means of dominance. In addition to parental regulations, the interviews revealed some examples of comparing ones' children to others: "Well I tell her all the time to look at her brother, look how handy he is, and you are leading him to the wrong side when he has to keep looking at you as you peek into that phone all the time." (Natalie's mother). In this way, the parents try to give their children either positive or negative examples of other peers or their siblings. The quote shows that the mobile phone is directly considered a tool with a negative impact upon the sibling.

Once again, with a certain degree of exaggeration, it can be said that on the other side of the struggle, are adolescents who intend to gain parental understanding. They are equipped primarily with a desire to negotiate and to explain their view of the world. If they cannot get their way or do not get space for enforcement of their opinions, this is followed by arguing with parents as well as circumventing and breaking their rules. Such circumventions include secret use of digital technologies despite the parental prohibition, or, with a disconnected wireless network, connecting to a wireless Internet in a shop.

The struggle for dominance between parents and adolescents is influenced significantly by the civic context. The civic context includes the present-day society, and its basic building blocks of digital technologies, which almost everyone encounters almost everywhere. Digital technologies are also connected to the future (the Industry 4.0, artificial intelligence, virtual reality, etc.) and the knowledge and abilities in the field of digital technologies will be increasingly important for a person's place on the job market. The parents are aware of this fact, and they rarely fully use their means or strictly limit their children's use of digital technologies. On the contrary, they consider the importance of ICT in these and future times, as shown by this quote:

> Because of the job, unless she wants to be a cleaning lady, I think that at least those basics of the work with the computer are needed completely everywhere. My husband works with a concrete mixer, one would think that it's not necessary there but he sits at the computer all day. (laughter) So I think that some basic literacy is necessary. In addition, I think that soon, she won't be able to buy even a loaf of bread without it (laughter). (Alice's mother)

As the example from the interview shows, the parents are well aware that digital technologies are expanding into all fields of life and that they are becoming a part of professions in which digital technologies were not used at all earlier. Parents try to give their children space, within the limits of their conceptions about ICT, for learning how to work with digital technologies. Here, the ambivalent relationship of parents toward the digital technologies in their children's lives shows very clearly. On one hand, they try to limit digital technologies in their children's lives and learning, on the other hand, they realize the importance of these digital technologies for the future. The statement by Natalie's mother suggests that parental ideas may be very unclear or not completely correspond to the present-day expectations in the field of digital technologies, in which "computer basics" have been insufficient for some time now. Nevertheless, there is still a generational struggle and it leads to several forms of the digital generation gap.

6.4 Various Forms of Digital Generation Gaps in Families

In all of the assessed families, some form of digital generation gap appeared. In the course of the struggle between two generations, the digital generation gap is determined by parental strategies, adolescent reactions, ways of communication in the family, and family free-time activities. In our sample, three forms of digital generation gaps were created by different views of digital technologies in the families. These were: *deepening the generation gap*, *status quo*, and *crossing the generation gap*.

6.4.1 Deepening the Generation Gap: Mutual Misunderstanding

In families of the *deepening the generation gap* type, misunderstandings were common. In the "struggle," parents fully use the means available to them, specifically prohibitions and limitations, often leading to misunderstandings and conflicts. This results in the adolescents' escape into the online world, where they seek understanding from their peers. The fact that families spend very little time together is an important characteristic of this type of digital generation gap. "It's true that I can't say that we would be like, come on, let's play a game together. That's a no. Everyone kind of spends their time the way they want to." (Natalie's mother). This element subsequently influences other areas of functioning as a family and into the

perception of the use of technologies in family environment. The parents themselves noted that all members of the household are free and spend time on their own. At the same time, they expressed misunderstanding of their children spending too much time with digital technologies, primarily with mobile phones.

The parents considered the digital technologies to be time thieves and thus they believed that their use had to be limited as much as possible. Similarly, they were afraid that with too much use, their children could become addicted to the digital technologies: "I think that technologies are a terrible time thief. Firstly, they can't even talk to each other in a normal way (…). I think that if someone really cannot pull in the reins, they have to be controlled, because you can surely become addicted to it, same as to anything else." (Alice's mother). However, this parental approach often leads to misunderstandings and to subsequent conflicts with adolescents. This is clear in the example from Natalie's family: "But in her case, when it escalates into such situations in which they have a videocall with a friend at 2 a.m. … that's just too much. Unhealthily much." (Natalie's mother). Natalie's mother even expressed desperation over how much time her daughter spends on her phone:

> When a friend called me, I told her – You're calling at the right time, because I don't know what to do about it anymore. Constant discussions, something wrong all the time. It's horrible, it's terrible. She can't do anything without it, she doesn't do anything without it. She has no Internet on the phone. So wherever she goes outside, she follows the wireless network. (Natalie's mother)

Natalie's mother was convinced that her daughter had her mobile phone with her at every step; she felt that her regulations lacked the effect she desired, because Natalie was able to circumvent her mother's prohibition by going out and connecting to the Internet in a shop in front of the house when her mother turned off the wireless network. Natalie's mother even accused her of passing her bad habits to her younger brother:

> F: But I also think that the boy has copied her style.
> M: Yes, the younger one definitely got infected from her. He wouldn't do it on his own, but I think since he sees her doing it. (Natalie's parents)

It is clear that the parents did not accept their failure in the struggle for dominance. They saw no other option but to enforce their view of digital technologies. Therefore, they were not capable of accepting a certain (self) reflection and altering their views or having a discussion with their children about the reasons for their frequent use of mobile phones. On the contrary, they accused their daughter of "ruining" her younger brother with her behavior. Natalie perceived the behavior of her parents as unjust, because from her point of view, she was not using digital technologies as often or to the same extent as some of her peers:

> It annoys me, because they keep telling me off because of it, but they cannot compare me with anyone else, because they don't have anyone else to compare me with. And if I tell them a hundred times that it is not that bad with me, so they just don't care about the others. I don't know, and everything's my fault. And my grandmother is of the opinion that she tells me that she thinks that my mother exaggerates, because she thinks something that is not really true at all. (Natalie)

In addition, Natalie felt the lack of interest and attention from her parents' side, when she herself mentioned that they do not know what she does all day, and she considered the parental accusations to be unjust and not based on the truth. However, in this regard, there will presumably never be an accord, because Natalie's mother stated in the interview that she was not very skilled with digital technologies and did not use them. At the same time, she stated that the reasonable extent of ICT use equals her extent of ICT use. "The reasonable extent is what I do. I check it in the morning, then I am at work the whole day, because I don't have any time, I check it in the evening and that's it." (Natalie's mother). Natalie explained her mother's behavior in terms of her childhood in a time without digital technologies. Natalie's mother has another idea about her adolescence as well:

> Mom, I think, in her case, this is caused by her being from different times. That there were no phones during her times. She might like the age, when she was young and there were no phones. And the kids went out every day, but the times were such that nothing was a problem. I mean, they could walk around, they could be out longer, because they weren't on the phones at home, they were outside. I might like it as well, but it cannot be like that any more now. (Natalie)

Natalie tried to understand her mother's perception of the present-day world and what her mother was affected by in her youth. This type of thinking, with a certain degree of empathy and an effort to understand her mother's adolescence, was unusual. It is unusual particularly in that most references to earlier times in our interviews were made by the generation of parents. Natalie also stated that the earlier use of free time was not unattractive to her, but that the current times do not allow it, primarily because Natalie's peers are not very interested in spending free time without digital technologies. This argument – that Natalie's friends prefer spending their free time exclusively with ICT and she adapts to them – was the one that her parents were unwilling to accept.

Parents disagree with the idea that the frequent use of digital technologies is a natural part of present-day life of the adolescents. On the parental side, strong regulations and strict prohibitions regarding the use of mobile phones are issued. The parents stated that the topic of extent of use of digital technologies was discussed with strong emotions in the family and that it was difficult for them to keep calm in these discussions: "I don't know if I would know how to tell her that in such a way that she wouldn't take it as coming from me, as a repeated complaint, or something like that. And of course we've talked about it a thousand times. And I'm not saying I talk about it with her nicely." Natalie's mother admitted that in the discussions about the use of digital technologies, she often failed to use a constructive and calm approach and her attempts at conversation often ended in arguments. She resorted to threats: "That she will go to a psychiatric hospital, one for gamblers … or we are telling her that her eyesight is bad." Both arguments were confirmed by Natalie.

Apart from threats, technical restrictions – primarily turning off the wireless network in order to prevent the access to social networks – are typical measures for digital generation gap type parents in the intergenerational struggle. Natalie vented her feelings by saying that the wireless Internet was turned off frequently and without warning from her mother: "We can't be on the Internet all the time, because the

thing is that I never know when mother leaves the wireless network on and when she turns it off. And then I happen to need to use the Internet and she turns it off and I don't know it" (Natalie). Blocking the wireless connection also occurred in Alice's family, in which the parents strictly limited their daughter's Internet use time to two hours a day and they turned off the house wireless network and confiscated their daughter's phone at 9 p.m.

> After school, she's allowed about two hours a day, because we found out that she would live a virtual life and that it had to be stopped. Before going to sleep, she would definitely want to use the phone as well, she has to put it on the windowsill here. At nine, the wireless network is blocked to her phone as well. I've got all of that taken care of. (Alice's mother)

The strong regulations are due to the lack of parental trust toward their children. This was revealed to be another important topic in the question of ICT use by adolescents. The parents did not believe that the adolescents would accept their advice regarding less extensive ICT use without a stronger parental intervention. The distrust was evident in the school preparations, when the parents doubted that their children needed to use a computer or a mobile phone to prepare for school.

> I: And does she ever come saying that she needs the Internet for that homework?
> M: Very often! (laughter) She tries that very often.
> I: You don't ever trust her?
> M: Yes, I check if it is really necessary.
> I: What specifically…
> M: Yes, if it can't be done without the computer. (Alice's mother)

This suggests that these parents prefer for their children to do their homework without digital technologies, even when such procedures are less effective than if the adolescents used the computer.

In contrast to Natalie's parents, Alice's parents did not complain about the unreasonably long time their daughter spends using digital technologies. This was not because Alice did not want to spend most of her free time with digital technologies, nor because Alice's parents were more tolerant of the time spent with digital technologies. The reason for this difference was that they chose diverse parental strategies, specifically very strong restrictions (restrictive mediation), and limited the time their daughter spent with ICT. With such restrictions, the parents basically fixed the problem of the excessive use of ICT. The time is clearly defined and it was decided on the basis of what the parents considered an appropriate time, which allowed the daughter to focus on other activities apart from ICT. Parental regulations in the form of limiting the time spent with digital technologies or turning off the wireless network are not the only strategy by which they try to prevent ICT use by their children. The parents also used less visible and explicit strategies. In Natalie's and in Alice's cases, it was clear that the parents were trying to minimize the time spent with ICT by making the children help around the house. The parents confirmed that the busier the children were, the less they wanted to spend time with digital technologies. The adolescent occupation with home duties is thus another parental measure close to the active distraction strategy. According to the parents, this procedure also had an educational goal: to learn a sense of duty and responsibility.

Within this type of digital generation gap, from the point of view of adolescents the parents introduced regulations without stating reasons or explanations. The adolescents therefore did not respect them and two types of revolt occurred. Less often, these consisted of open arguments with parents, as with Natalie: "Each of us is completely different, so we argue about the phone very often. Mom won't listen to any explanation and then she shifts all the blame to me and I am the worst and because she's the mom, I can't tell her anything. That's why we argue." (Natalie). The statement indicates the adolescents' desire for the discussions they want to have with their parents. More frequently, this resulted in a quiet struggle in which the adolescents shut themselves in their rooms and secretly used their mobile phone despite the explicit prohibition from their parents: "In my room. Because that's where nobody scolds me. I often really hide with the phone at home because mom often gets angry, so I hide" (Natalie). Similarly in Alice's case: "I don't know. I sometimes, for example when texting with Sofie, maybe I want to have the conversation a bit longer, so I sometimes I even keep it overnight." (Alice). Through such breaches of parental prohibitions, adolescents experience small victories.

Adolescents feel lonely and misunderstood because they lack a space for discussion in the family and they are limited by strong regulations coming from parents. They try to compensate these feelings with communication with their friends via the Internet. To do so, they try even harder to use their mobile phones at home despite their parents' prohibitions. They search for understanding and acceptance at least among their peers. However, their parents do not understand this and keep seeing the mobile phone as an inefficient use of time and therefore insisting on regulations.

The adolescents we surveyed talked to their friends most frequently via Messenger: "One girl from my class, I called her, and one, I slept over at her place… Well and we talked about our class, we gossiped a lot. And we talked about secondary school, because we kind of still don't know." (Natalie). This statement shows that adolescents often discuss difficult life decisions such as high school selection over social networks. The fact that Alice also uses Messenger for important conversations and not for merely to pass the time is proven by her statement: "So sometimes when I spoke to Sofie on Messenger instead of writing her, it was even better, because she could support me, she kind of told me to hold on, because I'd be off the school soon and so on." (Alice). Alice was not popular in school and did not have any friends in real life. Perhaps for that reason, some time ago she found a friend via the Internet who likes the same musical band as Alice does. After they met, Alice was able to talk about important topics with her new friend and find the support and understanding she did not have at home. Her parents did not know about her reasons and they did not know what their child was talking about using digital technologies; they only focused on the fact that she spent too much time on her phone. This misunderstanding was also manifested with Natalie in her consideration about setting up a second social media account. She would have one that would be visible to her parents, and a second secret one that would be outside of parental supervision. According to Natalie, this is a common practice among her peers:

> That for example I used to put a lot of stuff into Instastory with the kids from school, what we write to each other and so on, if I wanted to, when it was something the others could see, then she would just log onto Instagram and see everything there. That's why am not active on Facebook at all anymore. I change my profile picture from time to time, to have something new, but other than that, I am not active there at all anymore. Since she's on Instagram, I can't have anything there. I can create a profile where she won't be, a lot of people have a personal profile which is strictly private, I haven't created one yet, but I know I just would not let her in there. She wouldn't even know about it. (Natalie)

It can be assumed that strong parental regulations, a lack of trust, inability to have a dialogue with parents and a lack of support and understanding from parents creates feelings of loneliness in adolescents and causes them to retreat into their own world, a world to which they do not wish to admit their parents. Regarding this topic, Alice expressed her wish to have understanding for her future children, understanding she felt she lacked at home:

> I: Ahem, do you think that for example what you have with your mom, I mean that each of you listen to different things, that your mom doesn't like what you listen to, that later you won't like what your children will listen to, yeah?
> R: Yep. I kind of hope for liking the same things, so I wouldn't have to say turn off the music or don't talk about it. (Alice)

The situation is similar in the field of learning. If adolescents fail to find understanding for their needs in school and if they perceive education as bad, they search for technological solutions in some cases. Sometimes, these solutions can offer a better and more incentivized environment. This can be seen primarily in Alice's example: she was dissatisfied with English classes in school, and she spent her free time at home actually learning English, both by using various applications and by communicating with foreign friends and peers:

> Bad. Overall, I don't like English in school, but I'm saying, just when I am translating something for myself, or I can admit that I also had a call with another fan from Mexico, and that was great, and we could understand each other (…). Over YouTube and I am trying to listen and to write it down sometimes. And sometimes I just listen and try to translate it in my head. (Alice)

In this regard, Alice connected two things she likes that make her happy: English and music. Thanks to digital technologies, she can develop her skills in these fields, and she managed her learning on her own, and she was further motivated by the fact that she could immediately use her new English skills and abilities in communication with a friend from abroad.

6.4.2 Maintaining Status Quo in the Digital Generation Gap: Conditional Armistice

We named the second type of families *status quo*, because contrary to their peers in the previous type, the adolescents in this type of family do not want to live in conflict. They follow the set parental rules, even though they may not fully agree with

them. The adolescents take up parental values; parents trust them more and use minimal control. If the rules were broken, the armistice would be over and there would be generational conflicts. Adolescents in this type of digital generation gap typically do not tend to negotiate with parents and they are "obedient," and their parents even refer to them as such. The adolescents were aware of the consequences of a possible revolt and that's why they preferred to adapt. However, we consider it interesting that only the parents in this type put great emphasis on not driving their children too hard in terms of activities both with and without digital technologies. Only the parents of this type spoke about the importance of rest for their children.

The parents of the status quo digital generation gap type also tended to see the digital technologies in a rather negative light. At the same time, they admitted that digital technologies may be necessary for life and that it is fitting to take advantage of their useful properties, such as the option of immediately searching for information. On the other hand, the parents tried to limit the negative aspects the digital technologies bring.

The parents would have preferred to prevent the use of digital technologies and the access to the Internet, but because of their children, they accepted their importance in the present-day world. They bought the adolescents any technical equipment they wanted, and they also provided their children with a certain time during which they could use digital technologies without control or oversight. However, the children had to sufficiently compensate for their time spent with digital technologies with off-line activities without digital technologies. The adolescents adopted the parental considerations about digital technologies in the affirmative: "The negative aspect of digital technologies is for example spending money, that we spend a lot of money on technologies, because nowadays, phones often contain components that guarantee that the phone will break shortly after the warranty period, so we are spending a lot of money." (Matej). For Matej's family, the orientation toward spiritual values is clear; his family is religious. This manifests in terms of digital technology especially in the fact that emphasis is not put on movable property, thus not on technologies, and it is not so necessary to invest in them. By contrast, Petra's parents did not concern themselves with prices of technologies, but they tended to be afraid of social networks, since they considered the time spent there as wasted. Some of Petra's mother's fears might be justified:

> When she was 13, I had a feeling that I should monitor her, in case anything happened, but I kind of missed it, so I didn't end up doing it and now it feels like it's pointless. But it seems that the girls kind of like to take photos, those selfies somehow, they put it on Instagram and Facebook, well it kind of feels meaningless to me. The pictures of themselves. If they'd at least take a photo with their girlfriends and put it there, but to prettify themselves, take a photo and put it on some of those, that feels kind of stupid. (Petra's mother)

Petra agreed with her mother. In her statement, she said that for safety reasons, she was not very active on Facebook, nor was she active on Instagram. Petra's mother also noted that if her children failed to meet both parental requirements – had bad grades and simultaneously wanted to spend time using digital technologies, it wouldn't be possible. "I know that a long time ago, when my son had bad grades, and an old computer, I had confiscated the power cord to the computer until his

grades improved, and he was without the computer for fourteen days, for example" (Petra's mother). The possibility to spend time with technologies can also be sign for the adolescents that all is well on the parental side. The status quo generation gap parents appreciate the social networks among digital technologies, but only if they are used "reasonably." Their benefits lie primarily in connecting family members who live in different places and do not get to see each other very often.

> But what I do like is that they are variously connected to those, she has older cousins, older brother, and so, since they are connected via those Instagrams, so those kids, when they are abroad or something, they take a photo, sitting at an airport… And if they have it on, it will beep and show - Karla, the cousin, is here and there. So I like that they don't really know about themselves, but now they can see that she's in London. (Petra's mother)

It is typical for this type of digital generation gap that both parents and adolescents can confirm that they live in agreement, because there are no arguments or conflicts. But the interviews clearly showed that this was more of a peacekeeping operation and that this peace could be very easily interrupted by a possible act of disobedience against the will and wishes of the parents. The parents themselves spoke of their children as being nice and not rebellious and they presented it as a great advantage and as something both they and their children appreciate. This was proven by Matej's mother:

> He repeatedly does not do what he's supposed to, such as his school duties, or tidying up, nothing dramatic, I go to him repeatedly to do it and when I catch them on the phone, I confiscate it or tell him that unless it's done by such and such time, I will take the phone away, but mostly it is not necessary, because the children know what would happen, so they watch each other and obey. Matej does his chores, he has good grades, almost perfect grades. He's always functioned on some kind of a regime, that… He used to have anger issues and so on, but more or less he is an obedient kid. If he is told something, he tries to follow it so that it was done and he's happy with it that way. (Matej's mother)

Petra's mother responded in the same way: "Well, overall, I would say, she is still kind of, she does not rebel, she takes things as they come. …it is not like she would fight me over it or anything. Not like that." (Petra's mother). Therefore, the parents maintain the status quo with an ever-present threat of immediate punishment that the adolescents do not want to experience and they style themselves in the viewpoint of their parents:

> Well, not really, it used to be like, my mom warned me not to be on the phone and told me to go study instead and so on, when I was supposed to study for something, but now it is mostly up to me. But I just say it to myself, for example I turn off my phone so I won't get any messages when I need to study. So I won't get distracted. (Petra)

Matej spoke about the matter in a similar manner:

> I think that we don't have any problems with it, that my parents would have a problem with us being on the phone too much, they would tell us, but I don't think that there are any conflicts about it. For example, after 11 p.m., they tell me that I should turn off the phone and go to bed, so I do that, but otherwise I don't think that they limit me very much. (Matej)

According to these statements, the adolescents themselves believe that they primarily regulate their use of ICT on their own, even though they rather automatically fulfil the rules set by parents.

However, there is one field in which the parents of this type really do not like to see the mobile phones: studying. For the parents, the phone and learning do not mix, "paper and pencils" or "printed books" are what's used for learning; "When she's studying and I see that she's looking at it and she's still on the same page. When I come there, I say – give it here… Well, I call it the devil's instrument. Give me the devil's instrument. I will take it here. And then … when she's done, she'll take it back" (Petra's mother). The parents confirmed that they confiscated their children's mobile phones when they were studying so they were not distracted, especially by the messages which they constantly received on Messenger. The parental fears here were justified. Petra herself admitted that she would appreciate being allowed to spend more time on Messenger, because she does not have enough time to respond to her friends: "Well sometimes it would be useful if I could just a little more, so that I could for example respond to other people, so I would not be excluded all the time and for example if they call me ten times, one after another, and I turn on the phone two hours later." (Petra). However, Petra did not discuss her need with her parents in any significant way.

Overall, the parents agreed that the loss of possible control over children came with having a wireless network and Internet at home: "And since then, we don't have control, which is the biggest problem with the youngest daughter, who is on the mobile phone much more than she should be, so I confiscate the mobile phone." (Matej's mother). The loss of control over children is something the parents of the status quo type found it the hardest to cope with, and they often resorted to confiscating mobile phones. It is also the loss of control that they were used to having before the arrival of the Internet into the household and that was a part of their parental authority.

The parental approach to the free time of their children is rather specific for the status quo digital generation gap. In the other two types, the parents intentionally keep their children busy with duties and groups so they have less time to spend with digital technologies. With this type, the parents emphasize not driving their children too hard with chores and leisure groups. They consider rest and relaxation important. The adolescents have a leisure group organized once per week at maximum:

> She used to go to a folklore ensemble, that was here, she went to the Junák (Czech Scouts) since she was a kid. She used to go to summer camps. But other than that, I am not the type to … I didn't drive her anywhere. If it could be done here, then yeah, but not elsewhere. But we don't have the free time all planned out, let them rest a bit too. (Petra's mother)

Matej's mother expressed the same opinion:

> Definitely some free time, for example Matej has it balanced, he goes to this pokey [billiard-hockey] but it's not like he would have a leisure group every day, and there's a lot of such kids out there. They don't have any time for themselves, as they say, or any time that is not organized, all of their time is somehow organized, even the time outside of school, and then they are tired, both mentally and physically, and then it manifests by the body letting you know. (…) Those kids don't have a breath to spare. Just to look at the sky. The cause of the problems lies in them being overstressed, and that if parents want a healthy child, they just have to slow down. And then there's huge amounts of information the kids are subjected to. Coming from their phone, from billboards, from radio, from everywhere, and they don't

> have time to regenerate their mental faculties. I guess that some also don't sleep very much, because they are doing something all the time, then they are overstressed, they can be nervous, tired, exhausted, and that's not right. There is no balance between the work, the rest, but within the meaning of relaxation, the kids don't have enough relaxation, that's the most accurate word. (Matej's mother)

Matej's mother's view was also supported by Matej's father, who considered balance in children's activities to be rare.

> It is rare to see a kid who has it balanced, that they have for example two leisure groups, they have time to relax, they have time to go on a trip on Saturday or Sunday, to go to the forest, or something. And this is due to the huge possibilities everywhere. We didn't use to have these possibilities, there were only a couple of leisure groups, so we just ran around outside, but on the other hand, that had its benefits. (Matej's father)

According to Matej's father, the balance in activities can give the children a happy life. Matej himself did not agree with his parents one hundred per cent, as he said that if he had a more diverse program in the time after school, he would not spend so much time with digital technologies. "I feel like I spend a lot of time with it. Not that it is completely forced or anything, but when I don't have anything to do, I pull out the phone. If I had a more diverse program, I wouldn't pull it out so much." (Matej). The adolescents of the status quo digital generation gap stated that they used mobile phone when they were bored. Interestingly, it is in such moments that they use it for informal learning. For Petra, this use concerned applications developing her knowledge of a foreign language: "Partially, I also use some learning applications, such as for example Duolingo for languages" (Petra). For Matej, these were mostly knowledge games or learning card tricks.

The parents try to spend time together with their children as a family, for which they have time mostly during the holidays and weekends: "That's where they experience the unlimited space, starting with the garden, bunnies, dog, and continuing with Matej going to this shop along the river on his own, flying kites on a hill, which could happen much later here in the city, before he could go somewhere alone." (Matej's mother). Matej's mother was happy about spending free time in this manner, because she believed that outside of the city and digital technologies, the world was safer and she was able to let her children go out on their own without any worries, whether they went shopping or had some outdoor leisure activities. This implies that spending time together in the countryside alleviates parental fears for their kids, while on the other hand, digital technologies worsen these worries. Also, there is a visible connection with experiences from parents' youth and a faint nostalgia. This view of spending free time with the family in the countryside without digital technologies was also adopted by the adolescents: "Technologies can be harmful, because a person just sits inside with a phone instead of going to get some air with other people" (Matej). Matej's mother added that her son was not overly fond of technologies. On the basis of this opinion, she considered him reasonable. The question is to what extent Matej chose this view on his own and to what extent he was fulfilling the views and wishes of his parents. Spending free time together playing board games or watching movies with family was equally important to the parents: "For example, sometimes when I have a free weekend and a free evening

sometimes on Saturday and I'm not going anywhere and I want to rest for a while, then we for example watch a movie." (Petra).

6.4.3 *Crossing the Digital Generation Gap: Active Efforts for Mutual Understanding*

In the families of the *crossing the generation gap* type, there is discussion among the members and an effort to tolerate both generations. A tendency toward mutual respect in the matter of digital technologies in family life is clear here. There is space for expressing one's opinion and for compromises, especially if these compromises are made by the adolescents. There are no frequent conflicts between the adolescents and the parents, even though even in this type, both groups have tendencies to enforce their own ideas. Even in this type, the parents cannot be viewed as "fans" of digital technologies. They also build on experiences from their youth, in which digital technologies were not widespread. They also feel like their children use digital technologies too often. The parents wish for their children to use digital technologies for developmental and valuable activities and actions. In contrast with the status quo digital generation gap type, parents in the *crossing the digital generation gap* type see a number of advantages in digital technologies and they do not prevent their use. The difference also lies in the fact that they are willing to enter into discussions with their children and to give them space to express their own standpoint or explanation: "Sometimes we get into a conflict because I go to him and say – well and you are on the phone again. And he says – Mom, calm down, I am reading. And that's the thing, I never know if he's playing that damn game, or if he really is reading…" (Jiri's mother). Jiri's mother said that similar misunderstandings occurred from time to time, but that these were minor issues which were immediately explained in the family. The adolescents confirmed that they feel trust, tolerance, and understanding from their parents in the use of digital technologies, and that they appreciate it:

> I guess mom was more like this, when she used to care about it a lot, but now it's different and her approach is similar to the one the teachers have. You are of certain age and there is a certain degree of tolerance, some degree of agreement, then there's the thing when you know you really can't talk your way out of this. So earlier it was mom, now my parents tell me when they see me on the phone or with headphones… So I really read the notes on my phone and they tell me at that exact moment – go study (laughter). So I explain to them that I really am studying… (Jiri)

This statement clearly shows that the parents have discussions with the adolescents, give them space to express their own opinion or their own argument to convince their parents. As Jiri suggested, the openness to discussion and the degree of tolerance are also due to his age. At the same time, it is clear that the parents of this type also have an ingrained belief about digital technologies serving primarily for entertainment. It is hard for them to understand that the children use digital

technologies to study. There is also space for the adolescents to express their own opinions and desires when they want to buy a new game or a piece of digital technology:

> Then I know that mom bought me, that we bought one game… And when we bought it over the net, then it was with mom and it mostly included a fifteen-minute lecture on what it was about. Both on my part and on her part. The money can disappear from me and then the same can happen with the account, they will steal everything and it will be your fault. And then it was me, saying that this was a safe site, that it was not a problem and that it is not part of the game, but an expansion, or that it is a new game I want to buy and that for example I will give her my money if she buys it for me. (Jiri)

In the crossing digital generation gap, tolerance manifests itself in an effort by the parents to respect the musical tastes of the adolescents and vice versa: "I rather think that as parents, you try to kind of direct them toward what you like. So even the music we like, they are able to accept it, they even like a lot of it." (Renata's mother). This approach can be considered more liberal on the part of the parents than in the previous types, but the adolescents still act within certain boundaries set by the parents, and the adolescents still fulfil the parental views. Even the adolescents in the crossing digital generations type are controlled and guided by the parents; the difference lies primarily in how regulations are introduced and in the manner of communication between the parents and the adolescents. There is also a difference in how they spend their free time. The adolescents are typically often intentionally kept busy with leisure groups and household chores, and they also spend a lot of time together with the family. The parents trust their children and do not feel the need to limit their use of ICT very much. Similarly, with regard to their busy schedule, the adolescents themselves do not require the digital technologies very much and only use them when they're free. Generally, they view digital technologies as something primarily for the sake of variety, as relaxing by playing games or some activity on social networks. Generally, the adolescents self-regulate according to what is considered "reasonable" in the family. The adolescents themselves know what is too much, as Renata's statement showed:

> I: So you don't want to have Instagram?
> R: I guess I'll set it up in the future, but I haven't needed it yet, because when I already spend a lot of time on the phone and I add even more, then I guess I would just use it non-stop. (Renata)

To the question of self-regulation of ICT use, Jiri said that he did not use the mobile phone while walking on the street, because he felt that it could be dangerous and socially improper: "Or sometimes it doesn't feel right that you walk with the phone and it's kinda weird, that you expressly know that it is not a real book and you're staring into the phone and walking, and it's kinda bad, it has a bad effect on your surroundings, I mean, for example, you walk across the street without looking around and so on." (Jiri). He also stated that he only contacts his peers via Messenger if there's not enough time for a meeting in person, but that he avoids shallow conversations without deeper meaning.

> Yeah, you want to be in contact with him, but you want to talk about important stuff. And I would prefer the personal contact much more than contact over social networks. Well, it's

more like if you don't have time, you can do it via Messenger at any time. In the evening, you write with each other, you take a shower, you go to bed and write with each other. And you cannot really sacrifice fifteen minutes by travelling, going somewhere in the evening, then talk for like half an hour and then travel fifteen minutes back. You know, this is a half an hour of travelling for half an hour of talking, which simply is not worth it, when you have a school week, during which you study a lot." (Jiri)

In comparison to the adolescents from the previous types of digital generation gaps, the difference lies in these adolescents having their actions and values ingrained, while in the previous cases, it concerned almost exclusively avoiding conflicts with parents. An air of trust is present in this relationship because of the self-regulation of adolescents, which works well in view of the parents. Renata demonstrated a manifested trust of her parents because she could go wherever she wished with minimal parental control at the place where she lives.

We allowed the children to freely walk around the village a long time ago, because it would feel completely crazy for ten-year-old kids not to be allowed to, if I remember what we used to do, yeah, there are many more cars, various dangers, right, in the city for example, if she'd met with some gang. I don't think that this is a big problem where we live. But I think that on one hand, the kids have a lot of freedom, as regards right here in this case, over the Internet, but on the other hand, their moms won't let them go to the playground that is a couple of hundred meters from their house. (Renata's mother)

The statement points out the interesting problems of the freedom of children and parental control in the offline and the online world, in which the trust and non-separation of both worlds play a role. Renata's mother tried to give her children freedom in the offline as well as in the online world. Renata then appreciated this approach:

I: And don't you have to report to parents that you got home from school or anything like that?
R: Definitely not, but a lot of my friends in school do that and it really comes as a surprise, because they really have to control everything, the parents. I wouldn't like that. (Renata)

In the same way, the parents demonstrated their trust in their daughter by being understanding about the amount of time spent with ICT:

I: So does your mom chase you off saying that you've been on Messenger for a long time and that you should go to bed or do something else? Or anything like that?
R: Well, she is more like when my brother asks why I am on it so long, then mom tells him that – it's just something temporary I've got going at the moment. (Renata)

In Jiri's case, the parental trust was manifested in a trip abroad with his friends, specifically to Vienna, the capital of Austria, where they managed to arrange everything necessary for the stay (tickets, accommodation, program etc.) using digital technologies.

M: He and his classmate made a plan to go to Vienna.
I: They did everything on their own over the Internet?
F: Yes. Completely on their own.
M: Well, they booked a hotel for two days, said that they wanted to see theaters…
F: They chose some sightseeing routes and what they wanted to see.
M: Well, but he wasn't even fifteen.
I: He wasn't even fifteen.

M: Two months left to his fifteenth birthday and now deal with it, yes or no. At the school, the mother of that classmate of his, they bring him up in a very advanced way, he just stopped studying at the high school and he studies in Germany. She says – that's perfect, they found it on their own! And I say – what if something happens there? Nonono, they are responsible. Well, it's true that I was also of the opinion, that I thought they were both responsible. Well, three or four of them were supposed to go, but in the end, there were just two.
F: And I'd like to add that I didn't agree, of course. I was absolutely against it.
M: But they made it. (Jiri's parents)

Even though these parents were worried, they trusted their son to be responsible and to be able to utilize what he had learned both at home and in school, as well as the values they shared in the family. In addition, in this regard, all of this was made possible only by Jiri's skills and abilities to use digital technologies on a rather advanced level. In this type of families, the trust is manifested very clearly and the adolescents themselves participate in the building of the mutual trust to a significant extent.

Even though the parents are rather open to the digital technologies and they are willing to include them in the family life together, they still think that the children spend too much time with the digital technologies. However, there is a clear difference. In comparison to the deepening the digital generation gap parents, these parents do not put the most emphasis on keeping their children busy with household chores, even though the adolescents have to fulfill their duties as members of the household as well. On the contrary, the emphasis is put on the children's leisure groups. The parents care the most about the development of their children in the course of activities they enjoy. The parents admit that they intentionally keep the children busy to prevent the children's inclination to socially pathological phenomena and also to the excessive use of ICT:

M: He can't really be on the phone that often, he comes home at half past seven.
F: Keeping the children busy is the alpha and omega. I can say about our children that they barely have any time.
M: They keep saying so. But it is intentional, conscious. (Jiri's parents)

In comparison to the previous types of digital generation gap, these parents prefer to tire the children out. According to their parental philosophy, it's important to keep children busy and tired, so they do not have time and energy to incline to socially pathological phenomena. In addition, the parents want to teach their children responsibility, s sense of order, and the value of money: "On Monday, he really comes home at seven…on Tuesday, he comes home at half past seven, on Wednesday, he has clarinet and piano lessons, so he comes home at six, on Thursday, it's half past seven again and on Friday, he is free. Last year, he got himself a temporary job, so he has a temporary job during the weekends." (Jiri's parents). Jiri is raised in the spirit of parental trust the adolescents of the deepening the digital generation gap type dream of. However, there is another side to this trust, which the adolescents of the first type do not realize. The adolescent has to earn the trust and show the parents that they are truly capable of living an "adult life," a capability of which the adolescents convince their parents in discussion and elsewhere. Earning money, demonstrating responsibility, and maintaining a full schedule are part of adult life. It seems

that the parental trust is important to the adolescents of this type and it is worth their busy and responsible way of life, even at the expense of not having much free time and thus time to use digital technologies as some of their peers do.

The parents realize that it is necessary to constantly keep working on mutual tolerance and respect. They believe that this is built primarily by spending free time together: "Well at least so that we could say something to each other and be together, because it would not work at all otherwise. Well, on the weekends, we try to play some games in the evenings sometimes or watch movies together on Friday." (Jiri's mother).

Renata's statement proves this as well: "The thing is, Mom goes to exercise every Wednesday morning and she says that she always feels so good and that she wants all of us to feel good. So they always find something for us to do (laughter). …Then we went to a hotel and had fried cheese. And pancakes. We were there for a long time, it was Mom's name day." (Renata). Apart from exercising together, eating together, and participating in family rituals, the parents said that when they have time, they go to cultural and social events or on trips together.

The families of crossing the digital generation gap type are the only ones from our sample to spend time with digital technologies:

F: We had a somewhat broken camera, which could kind of record, so we actually recorded a film. That means that we would record a toy, move it, make a step, another short recording, move it again and then interwove it with something, we made some backgrounds…
M: That was beautiful. What a movie!
F: And then, when we played it, the movement was broken, but it was in fact a movie. (Jiri's parents)

The statement shows that, the bond between Jiri and his father grew stronger thanks to digital technologies, but at the same time, it was time spent in a valuable way, as the parents wished. The parents found a way to effectively and valuably integrate digital technologies into their family life. For Renata, viewing photographs on the television was another shared experience strengthening the cohesion of the family.

R: Or, for example, we watch some photos. We mirror them on the television from the tablet.
I: You show them to each other.
R: Yep.
I: Even with parents?
R: Yeah, with parents.
I: And what kind of photos are these?
R: Well from family trips and the like. Grandma often wants to see them. (Renata)

The adolescents of the crossing the digital generation gap type were unusual in that they often used digital technologies for informal learning and for improving various skills. Digital technologies were also a part of their hobbies. Cooking was Jiri's hobby and he searched for the recipes on the Internet. However, he mentioned that he generally did not have a lot of free time and he knew that in comparison to his peers, he did not spend a lot of time on the Internet. He played computer games for relaxation and his father approved of it, because he considered these games developmental: "But all of the games are actually on the basis of …I want to build

something, I need to have the resources for it, then, in order to have it, I have to do something socially aware, which means that I have people there I am responsible for, I have to feed those people, I have to provide those people with this and that so they would bring me this and that." (Jiri's father). Renata showed a targeted effort to learn informally and to develop in the fields of her interest. In her case, this was primarily in drawing, design and recording of movies:

> Well, but mostly they there, I have a lot of photos there with a pencil and then I make it in color to make it a little different, or I do it by the photos to at least learn something from it. (…) Or, we have the kitchen connected to the living room, so if I design something on Sketchup, I can for example do a room with windows there and so. (…) Me and my friends, we started shooting movies during the holidays (laughter). And mostly it ended up very badly, because we had the wrong programs for recording, editing and stuff even got lost and so on. Me and my sister liked it, so we found ourselves, we wanted to do the editing on our own, because the girls did it on their computer. And so we recorded something in the garden, speeded up jumping on the trampoline, or some silly things like that. And then we tried modifying the color and so on. (Renata)

There is another benefit in this example of informal learning: the strengthening of relationships with peers and siblings that occurs within cooperation and joint activities thanks to the use of digital technologies. In the crossing the digital generation gap type, the adolescents did not list social networks as their main way of using digital technologies, as was in the deepening the digital generation gap type. It can be presumed that they have functional relationships with parents and even peers in the offline world and they do not need to seek escape online.

6.5 Conclusion

In this chapter, we tried to look deeper into the everyday lives of several Czech families with the intention of describing and explaining how digital technologies permeated their lives, how parents perceived the digital technologies, and how their children (present-day adolescents) used the digital technologies. We were also interested in whether and how the rules for the use of digital technologies by adolescents were set up in the families, because these rules create frameworks for the use of ICT in various adolescent activities. The selected methodology provided detailed insight into the everyday lives of the investigated families, but at the same time the selected research design does not enable the generalization of our findings. However, families with similar characteristics would probably act similarly (Kennedy, 1979; Yin, 2012).

In our research, the parental approach to digital technologies was characterized by a search for balance between the care and control or between the autonomy and dependence of the children in the family (comp. Hagen, 2007). At the same time, the parents used regulations with the intention of balancing the children's activities indoors and outdoors, with and without digital technologies, as well as their individual and joint activities (comp. Plowman et al., 2010). This search for balance and

use of regulation was shown to present a dilemma for all of the interviewed parents. The parents' own life experience or inexperience with digital technologies, which formed their current attitudes, was very important in our research (see Mannheim & Kecskemeti, 1964). This experience seems so determinant that in some cases, it was difficult for the parents to accept various opinions and perspectives on the role of digital technologies in family life or in their children's life. Apart from the search for balance, there was also the greater or lesser (authoritative) parental pressure on their view of digital technologies being unambiguously decisive. On one hand, the parents were aware that nowadays, their children cannot be completely "protected" from the dangers associated with digital technologies. At the same time, the digital technologies created friction between the parents and adolescents. Such friction may result in conflicts, even long-term ones in some cases. The dissimilarity of the parental and adolescent views of digital technologies and the manners of negotiating the use of digital technologies in the family are the bases for three types of the digital generation gap: deepening the generation gap, status quo, and crossing the generation gap.

The parental fears of digital technologies were a dominant topic in our results. This result is not completely surprising considering previous studies (Chaudron et al., 2018; Clark, 2009; Helsper et al., 2013; Holloway & Valentine, 2003; Horst, 2010; Mesch, 2006).

In our sample, the parents did not differ from the international data, because for example parental mediation strategies are motivated by fears of this type even in other European countries. The parental selection of a certain mediation strategy relies on many factors, including the perception of and approaches to digital technologies connected to the parents' knowledge and experience with digital technologies. The penetration and acceptance of digital technologies in the society in which the parents live are also factors (Chaudron et al., 2018).

Our results suggest that in these fields, we can look for the reasons for parental fears even in our research, where the historical-social space plays an especially important role. In our sample, the parents' lives and experiences with digital technologies were important determinants of their views toward these technologies. Their experiences were affected by the periods of late socialism and the transformation of the Czech society in the 1990s. As shown in the second chapter, digital technologies penetrated the life of society at that time rather slowly, not even entering the school environment before the beginning of the twenty-first century. However, the fall of the Communist regime in 1989 was also followed by significant changes in values, and fields such as economics and culture changed significantly. A childhood under socialism included collective life, intensive social contacts combined with the impossibility of free contact with Western countries, low individual self-confidence, and fear or often traumas from school. During socialism, children and adults had limited or no options to choose from, and childhood was usually a safe and calm environment. Post-socialism brought autonomy, greater self-confidence, individualism, diversity, and social differentiation into children's lives. Various family environments formed gradually, and the family life and upbringing changed. It became possible to freely choose between various lifestyles or free-time

activities (Nosál, 2002). Travelling options expanded significantly and options to study abroad appeared. In our sample, all of this change is part of the life experience of parents, which formed their views of life and of parenthood. With a certain degree of exaggeration, we can see in them a mix of socialist, post-socialist, and current values, views, and approaches toward digital technologies and other fields. We consider this mix to be one of the important causes for parental fears of digital technologies. It also includes a certain nostalgia for the past in which digital technologies did not play such an important role. At the same time, parents realize the importance of digital technologies in the lives of their children and in society. It seems that there is no common unifying pattern for approaches to parenthood in post-socialist countries because the parental values and approaches manifest different trends in the post-communist EU countries (Hamzallari, 2018). That is also why we find both identical and different approaches to mediation strategies in post-socialist countries and in countries without any totalitarian experience whatsoever (for more details, see for example Chaudron et al., 2018; Helsper et al., 2013).

In our research, we indicate how these worries can influence the formation of the digital generation gap and into its various forms. In our sample, the fears of digital technologies were mentioned primarily by the parents of the deepening generation gap and status quo types. The fact that the parents themselves did not use digital technologies very much and lacked more extensive skills and abilities in the use of digital technologies is one cause of the rising fears (comp. Horst, 2010). They were primarily afraid of the excessive use of the mobile phone by adolescents. They also saw the excessive use of online communication in a negative light, because according to them, it can result in an insufficient development of communication skills. In addition, the parents considered such communication a waste of time. The acquired data suggest that the fear of digital technologies tends to arise primarily in parents who are used to having control over their children and demanding their respect. The respect itself was the sensitive topic, because the parents realized that they could not earn it in the field of digital technologies, and this interfered with their dominance. Because of digital technologies, some parents may fear losing their parental position of authority (Clark, 2009).

It is an important discovery that the parental fears of digital technologies are connected to their view of digital technologies and their use in adolescents' learning, especially in preparation for school at home. The parents tended to forbid their children to use digital technologies at the time of preparation for school, regardless of the digital generation gap type. They explicitly asked their children to use "pen and paper" in working on their homework or to use printed study materials. They were led by their fears that the adolescents would use digital technologies for communicating with their peers instead of for learning. These fears were sometimes justified. In our research, the parents considered digital technologies to be primarily tools for wasting time and for adolescent entertainment. They responded with suspicion if their adolescents used the mobile phone in preparation for school, for informal learning, or for reading. In this case, the parental inexperience with the use of digital technologies for their own learning plays a main role, as does the situation in the Czech Republic (see Chap. 2), in which the parents did not have and in fact

still do not have a lot of options for learning about the possibilities of digital technologies in education. The cooperation between the school and the parents was also a challenge in this regard.

However, the situation was rather different from the adolescent viewpoint. The adolescents of the *deepening generation gap* type use digital technologies for entertainment and other purposes, but the main purpose of their use of digital technologies was to maintain relationships with their peers, with which they replaced the (in their opinion) dysfunctional relationships in the family. The adolescents of the *crossing generation gap* type preferred the utilitarian use of digital technologies and they used them primarily for practical needs such as searching for travel directions, using online maps, and for shopping online. This concerns informal learning as well as of the development of digital literacy (Erstad, 2010; Martin & Grudziecki, 2006).

Parental fears of varying strength regarding the consequences of ICT use by their children lead to a choice of various parental mediation strategies, an important element in the typology we created for these parents. At the same time, the selection of a certain strategy on the parental side leads to a certain reaction from the adolescents to the selected parental mediation strategies (Haddon, 2015). The *deepening digital generation gap* type parents primarily used (technical) restrictive mediation strategies. These parents confiscated their children's phones or turned off the wireless network. They also admitted that they did not trust their children. Such parental behavior evoked negative feelings in the adolescents and made them feel guilty about using digital technologies. They felt misunderstood and they did not feel any effort to have a discussion or to reach an understanding on the parental side. At the same time, they experienced the dilemma regarding the degree to which they should accept the negative parental approach to digital technologies as their own, or, on the contrary, whether they should adopt an approach to digital technologies that was more characteristic of their peers or "present-day adolescents" in general. In the end, they tended to look for ways to bypass or break the parental regulations, which usually led to arguments with their parents. In the *status quo* type, the parents used restrictive mediation when they demanded obedience and threatened sanctions for disobedience. The adolescents reacted to such strategies by following and respecting the rules and by accepting the rules as their own. With the *crossing the generation gap* type, an effort to establish active parental mediation was the typical strategy. Some parental restrictions occurred in the case of this type as well (primarily regarding limitations of the adolescent time spent with digital technologies), but a discussion with the adolescents was included in communication with this type. The parents trusted the adolescents and provided them with a rather significant degree of both freedom and autonomy. The adolescents then accepted the parental regulations with understanding and did not feel the need to circumvent them.

On the basis of previous results (see for example Horst, 2010), we expected spending time together with the family to be an important topic in our research. Our results have shown that how free time is spent varies in the individual types of the digital generation gap. For the *deepening generation gap* type, the families do not spend free time together, which creates an unclear parental idea of the manner in which the children spend their free time. At the same time, the parents of this type

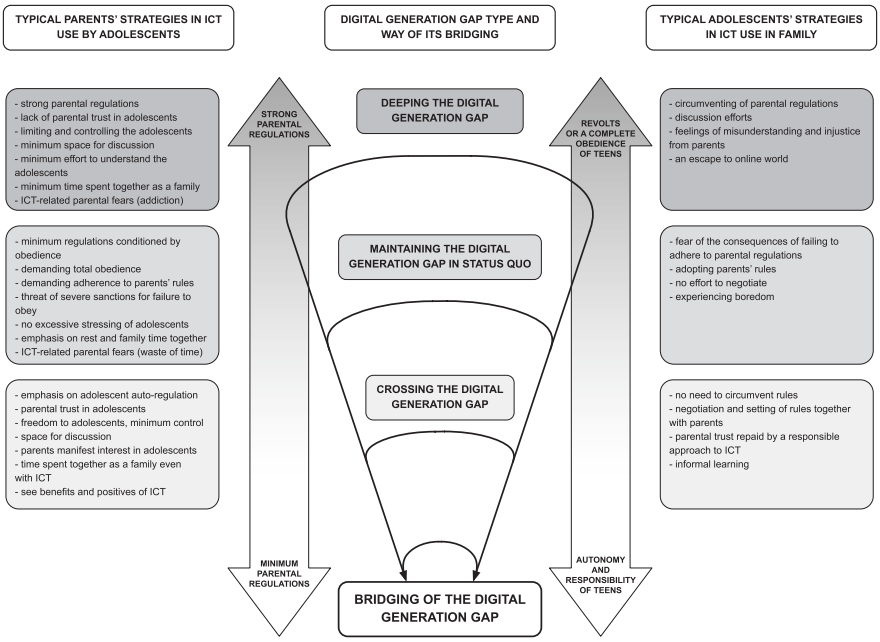

Fig. 6.1 Three types of detected generation gaps

try to limit their children's time with digital technologies by keeping them busy with household chores. For the *status quo* type, we recorded a rather unusual approach in which parents tried not to overstress their children and instead put great emphasis on the children having enough rest. They considered time spent together in nature to be the ideal way to rest, and at the same time it results in the children not spending time with digital technologies. For the *crossing the generation gap* type, the parents typically tried to keep the children busy with free-time activities, so that they did not have time for digital technologies and the parents did not have to limit this time themselves. With this type, children and parents spend free time together while using digital technologies. The individual parental approaches to adolescent free time vary, but these parental efforts to affect the children's free time have the same goal (more or less explicitly expressed): to limit the time spent with digital technologies. This leads to approaches approximating the active distraction strategy (Chaudron et al., 2018).

The summary of our results and the characteristics of the individual types of digital generation gap is shown in Fig. 6.1. Once again, the summarization of the main results led us to contemplating the existence of the digital generation gap. Together with Clark (2011), we believe that digital technologies do not have to cause a digital generation gap.

Our results suggest that smaller or larger digital generation gaps appear in families, and in many regards there is not enough space or willingness to bridge or fill this gap or to let it completely disappear. Nevertheless, we have found a number of

stimuli for bridging the generation gap in the results. The diagram shows that the least significant efforts to bridge the digital generation gap are found in the *deepening digital generation gap* type. The most significant efforts were recorded in the *crossing digital generation gap* type. Nevertheless, in all of the identified digital gap types, there are active or explicit efforts to bridge the digital generation gap.

On the basis of the performed analyses, we believe that the size or the depth of the digital generation gap is reflected by how and how much family members communicate about the use of digital technologies and in what way the adolescents in families are given space for their own autonomy in the use of digital technologies. The diagram includes the *bridging the digital generation gap* type, which can be considered a sort of ideal state enabling the bridging of the digital generation gap and leading to a "digital generation harmony." This type involves a condition in which digital technologies do not represent a source of conflicts in the family. On the contrary, they are a part of the family life, in which both children's and parents' views of digital technologies and their real use in various life situation and contexts are coordinated.

We believe that the parental regulation strategies and their communication in the family play a fundamental role in bridging the digital generation gap. It appears that a certain degree of freedom and autonomy provided to adolescents by their parents leads to happier adolescents within the family. This happiness is further manifested by the adolescents themselves, who think more about the activities and time spent with digital technologies and try to regulate their use responsibly. However, the effort of both the parents and the children to communicate and to look for common solutions to various life challenges related to the use of digital technologies is necessary. Such efforts are the pillars on which a digital intergenerational bridge between the parents and their children can be built.

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Part III
Digital Teens' Use of Technologies in the Context of Everyday Life

Chapter 7
Young People and the Development of Digital Competence and Autonomy

Abstract In previous chapters, we focused in detail on the use of digital technologies and on the connection between the availability and use of digital technologies and school performance. Digital technologies are not merely a way to learn about new fields and topics; they are a pivotal field in which present-day teenagers acquire sufficient skills and abilities in order to succeed in both their professional and personal lives. Children acquire these abilities gradually from the age at which they start using digital technologies, and this age is continually younger. In this chapter, we focus on how the age at which Czech children start using digital technologies influences the development of their digital literacy as teens, and what roles other factors connected to the use of digital technologies play in this development. Specifically, we focus on the connection between the age at which the children start using digital technologies and the Internet and the degree of their perceived competence and autonomy in the use of digital technologies at the age of fifteen. At the same time, we consider whether this relationship is mediated by other variables such as the degree of use of digital technologies or interest in digital technologies.

In the first part of the chapter, we present the topic itself and list the main research questions for this chapter. We describe the methodology of the performed analyses and offer a basic description of the individual variables used within the analyses. In the two subchapters, we present the results of the performed analyses, first in the context of the age at which the children start using digital technologies, and then in the context of the age at which they start using the Internet. In the final subchapter, we summarize the answers to the research questions and put our findings in a wider context.

Keywords Digital technologies · Internet · Children · Teens · Digital literacy · ICT competence · Autonomy · Interest · Social interaction · PISA

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7.1 Theoretical Background

The skills or abilities connected to the use of digital technologies are the main topic of this chapter. In the context of the existing pedagogical research, the topic is connected to a number of varying terms and concepts. The term "digital literacy" is one of the most often used (Erstad, 2011; Lankshear & Knobel, 2008; Sefton-Green et al., 2009; Tsitouridou & Vryzas, 2011); another is "ICT literacy" (Katz & Macklin, 2007). One can also encounter more specific terms such as media literacy (Erstad, 2010), computer literacy, and information literacy (Fraillon et al., 2014). By contrast, there is the very general term "new literacies" (Coiro et al., 2008; Knobel & Lankshear, 2014), which includes literacy connected to the use of digital technologies. Even in the context of digital literacy, some authors prefer using the plural and the designation "digital literacies" to make clear that this does not concern any single specific literacy, but rather a set of several different literacies.

Instead of literacy or literacies, some authors have written about digital skill or skills. "Digital skills" is probably the most frequently used term, and it is part of the wider framework of "21st century skills" (Binkley et al., 2012; Griffin et al., 2012). The term "competence" is also used in connection to digital technologies, specifically digital competence (Calvani et al., 2012; Erstad, 2008; Ferrari, 2012; Hatlevik et al. 2015a, Hatlevik et al. 2015b) or ICT competence (Aesaert & Braak, 2015; Juhaňák et al., 2019); these terms are also used in this chapter. Whether we speak of literacies, skills, or competencies, the general idea in all cases is that there are digital technologies on one side and the ability to use digital technologies effectively and efficiently on the other. For the purposes of this chapter, we can consider the terms as more or less synonymous; the term "ICT competence" is understood as the ability to use information and communication technologies (Aesaert et al., 2015; Calvani et al., 2012; Hatlevik & Christophersen, 2013; Hatlevik et al., 2018). In addition to ICT competence, in this chapter we also address ICT autonomy, meaning autonomy in the use of ICT, which reflects the individual's perceived control and self-directedness in ICT-related activities (Goldhammer et al., 2016). In comparison to ICT competence, the term ICT autonomy emphasizes primarily independence in the use of digital technologies and the ability to use digital technologies to pursue one's own interests and goals.

The issue of the development of digital competencies in children and adolescents is traditionally researched primarily in the context of schools and formal education. However, researchers increasingly warn that school is neither the only nor even the main space in which students learn the skills to use digital technologies (Arnseth et al., 2016; Erstad, 2012). On one hand, it appears that teenagers use digital technologies much more frequently in the home environment and in connection to leisure activities than in the school environment or to perform school-related activities (Eurydice, 2011; Wastiau et al., 2013); on the other hand, it seems that the use of digital technologies in the home environment or during free time offers much greater opportunities for the development of digital competencies (Fraillon et al., 2014; Hatlevik et al., 2015a, 2018). Our results, presented in the previous chapters,

tend to confirm that the home environment, family, peers, and free time play the dominant roles in the development of digital competencies.

The age at which children start using digital technologies and the Internet has been gradually lowering (Chaudron, 2015; Chaudron et al., 2018; Holloway et al., 2013; Ólafsson et al., 2014). It is not extraordinary for children to start using digital technologies even before their first day of primary school (Johnson, 2010; Marsh et al., 2017; O'Hara, 2011). Thus it seems that the role of the family environment in the development of digital competencies is growing more and more important, because it is the family and the home environment in which the children acquire their first experiences with digital technologies and thus it is there that they are offered the first opportunities to develop their digital skills.

That was one of the main reasons that our research focused on the age at which children acquire their first experiences with digital technologies and the Internet and on the question of whether the age at which students start using digital technologies is connected to the degree of their ICT competence and ICT autonomy later in life (specifically at the age of fifteen). Our general starting assumption was that the earlier in life a child starts to use digital technologies, the more time they have to learn to work with them adequately and to achieve the necessary competence and autonomy in their use. This assumption is supported by several existing studies including our own, within which we focused specifically on the connection to the age at which the children started to use a personal computer (Juhaňák et al., 2019). Instead of the age at the time of the first computer use, whether digital technologies or the Internet, some studies worked with the number of years that a child or teenager had been using digital technologies (see Deursen & Dijk, 2011; Deursen et al., 2011; Hargittai, 2005; Hatlevik et al., 2018). Livingstone and Helsper (2007) focused on the number of years that children had been using the Internet; they discovered that children using the Internet for more years and generally more frequently develop their Internet literacy to a greater extent. By contrast, those that started using the Internet later approached the use of the Internet rather conservatively, did not experiment, and tended to keep to rather simple procedures, habits that reflected negatively upon their development of Internet literacy. Similar findings in connection to Internet literacy were reached by Deursen et al. (2011), who discovered that the number of years that the children used the Internet was significantly connected to the degree of development of their Internet skills.

The development of digital skills is a complex phenomenon that is significantly affected by factors other than the age at which children start using digital technologies or the Internet. The development of ICT competence and ICT autonomy can be significantly affected by a number of other ICT-related factors. The frequency or intensity of the everyday use of digital technologies is a factor that deserves attention in the research of the relationship between the age at the first use of digital technologies and the level of digital competence at the age of fifteen. This factor may play an even stronger role than the age at which the children start using digital technologies. If a child or an adolescent uses digital technologies regularly to a greater extent, they can spend more time with digital technologies than one who started using digital technologies at an early age but does not use them so

intensively. A teenager using ICT more frequently or to a greater degree can thus have enough time to acquire the necessary competencies even if they started to use the digital technologies at a later age. A number of researchers have focused on the degree or frequency of ICT use in connection to the development of digital competence (Alkan & Meinck, 2016; Fraillon et al., 2014; Hatlevik et al., 2015b; Livingstone & Helsper, 2007; Rohatgi et al., 2016). The existing results largely confirm the presumption that a larger degree of ICT use is connected to higher ICT competence. Nevertheless, the wider context has to be taken into consideration even within this relationship. The use of digital technologies by children or adolescents can occur in various environments and in connection to various activities that can affect the connection to digital competence significantly. Hatlevik et al. (2015b), who monitored (among others) the use of digital technologies in the school environment, found a negative connection to digital competence: the use of digital technologies in school to larger degree connected to a lower level of digital competencies. It seems necessary to at least distinguish whether the digital technologies are used in school or in the home environment, or possibly if the digital technologies are used within leisure activities or for homework or school-related activities such as doing homework and preparing for class.

Apart from the frequency of use of digital technologies, other factors may be considered to play a role in the development of digital competencies of children and adolescents. Factors directly concerning digital technologies and their use in this regard include children's interest in digital technologies, specifically how much they enjoy using and working with digital technologies. ICT interest can be understood as a factor related to the motivation to use digital technologies. According to Goldhammer et al. (2016), there is a motivational disposition or a preference to participate in activities that include use of digital technologies. This preference can have different sources. It can be based on positive feelings connected to the use of digital technologies or it can be based on an understanding of the benefits of using digital technologies to perform specific tasks or achieve personal goals (Christoph et al., 2015; Goldhammer et al., 2016; Zylka et al., 2015). For interest in digital technologies, we can presume a positive connection to the frequency of use of digital technologies and also to the level of digital competence and autonomy. ICT interest is thus primarily connected to intrinsic motivation, which is characterized by a larger degree of participation and a higher quality learning process (Deci & Ryan, 2000; Ryan & Deci, 2000). We can expect a more significant development of digital competence as well as autonomy in the use of digital technologies in children with higher interest in using digital technologies (Chaudron et al., 2018; Christoph et al., 2015; Murphy & Beggs, 2003).

Peers are another factor that plays a very important role, especially in the life of young people. Regular social life and interaction with peers undoubtedly influence the use of digital technologies as well and thus implicitly influence the development of digital competences of children and adolescents. Informal learning occurs very often within everyday social interactions (Goldhammer et al., 2016). If this concerns communication and interaction with peers, even "peer learning" can occur (Vekiri, 2010; Verhoeven et al., 2016). It can be presumed that the degree to which

the digital technologies form a part of the everyday social interactions of children and teenagers has a positive effect on the level of their digital competence. There is not yet a single generally accepted process for simply measuring this factor, but Goldhammer et al. (2016) believed that it could be understood as children's personal need to share their experiences, knowledge, activities, and general interest in digital technologies with others.

The theoretical starting points and the results of the existing studies led us to our main research question:

- Is the age at which children start using digital technologies and the Internet connected to the degree of their digital competence and autonomy in the use of ICT at a later age, and if so, to what degree?

In order to answer this question, we used data from the PISA 2018; we concentrated on the relationship between the age of the first use of a digital device and the Internet in Czech pupils and their level of ICT competence and ICT autonomy at the age of fifteen. At the same time, we presumed that this relationship might be significantly mediated by other variables as well. In the course of searching for answers to the set question, we analyzed the direct relationship between the age of the first use of digital technologies and the Internet and the level of digital competence/autonomy at the age of fifteen, and we also paid attention to possible indirect effects, since this relationship can be mediated by other variables. The mediation model we considered is displayed in Fig. 7.1. As the figure shows, the monitored relationship can be mediated by the degree of use of digital technologies for school purposes, the degree of use of ICT for leisure activities, interest in digital technologies, and the degree to which the digital technologies form a part of the everyday social interaction.

Based on the conceptual model in Fig. 7.1, we broke our general question into four specific research questions:

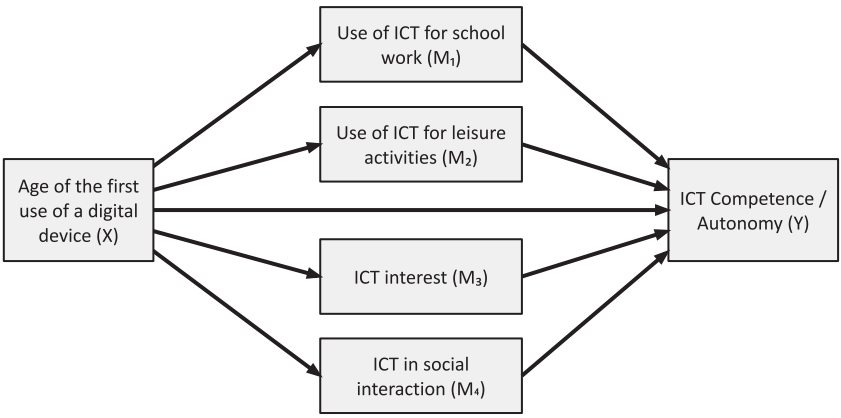

Fig. 7.1 A conceptual diagram of a parallel multiple mediator model with four different mediators

- To what extent is the age at which children start using digital devices related to the degree of their perceived ICT competence and autonomy at the age of fifteen?
- To what extent is the relationship between the age at which children start using digital devices and the degree of their perceived ICT competence and autonomy at the age of fifteen mediated by the use of ICT for schoolwork, the use of ICT for leisure activities, interest in ICT, and ICT in social interaction?
- To what extent is the age at which children start using the Internet related to the degree of their perceived ICT competence and autonomy at the age of fifteen?
- To what extent is the relationship between the age at which children start using the Internet and the degree of their perceived ICT competence and autonomy at the age of fifteen mediated by the use of ICT for schoolwork, the use of ICT for leisure activities, interest in ICT, and ICT in social interaction?

As in Chaps. 4 and 5, we used multilevel modeling (Heck & Thomas, 2015; Hox, 2010; Snijders & Bosker, 2012), which is a suitable method for analyzing data from the PISA research. However, since we presumed that the analyzed relationship was mediated by other variables as well, we also used a mediation analysis (Hayes, 2018; MacKinnon, 2008). The analysis itself was performed in the R statistical environment (R Core Team, 2018) using the *BIFIEsurvey* library (BIFIE, 2018). All analyses were performed separately for ICT competence and separately for ICT autonomy, even though we report the results of both models in a joint diagram and a joint table. Since the variable of the age at the first use of digital technologies/the Internet is of a categorical character, we present the results of the mediation analysis in the form of relative total effects, relative direct effects, and relative indirect effects (see Tables 7.3 and 7.5). We used a Sobel test to test the statistical significance of indirect effects (Sobel, 1982). In all the analyses, gender and the index of economic, social, and cultural status were used as control variables. Table 7.1 presents the basic descriptive data of all quantitative dependent and independent variables used within the analyses. The table of correlations between the individual variables is attached at the end of the chapter (Table 7.6).

Table 7.1 Descriptive statistics of continuous variables used in the analysis

Variable description	Min	Max	Mean	SD	Number of cases	% of missing
Perceived ICT competence	−2.60	1.99	−0.18	0.92	5985	14.7
Perceived ICT autonomy	−2.51	2.03	−0.15	0.91	5974	14.9
Use of ICT for schoolwork	−2.30	3.31	−0.07	0.99	6079	13.4
Use of ICT for leisure activities	−3.59	4.25	0.01	1.00	6285	10.5
Interest in ICT	−2.95	2.68	−0.22	0.91	6069	13.5
ICT in social interaction	−2.18	2.36	−0.19	0.98	5915	15.7
Index of economic, social, and cultural status	−7.60	3.59	−0.21	0.88	6911	1.5

7.2 The Effect of the First Use of Digital Device on Digital Competence and Autonomy

The data analyzed in this chapter were collected from 7019 students from 333 different schools; girls made up 50.1% of the total number of students. The students were fifteen or sixteen years old when they completed the questionnaire (mean = 15.8; sd = 0.28). Of the 7019 students, a total of 6604 (94.1%) students answered the question regarding their first use of a digital device. A total of 57 of those students stated that they had never used any digital device. These students were excluded from the analysis; the final sample for this part of the analysis thus constituted 6547 Czech students.

In the course of answering the first research question, which was focused on the relationship between the age at which children started using digital devices and their digital competence and autonomy at the age of fifteen, we focused on the differences in both dependent variables and all four considered mediators on the basis of the individual age groups. For the age at the first use of digital technologies, we distinguished four age groups: three years old and younger, four to six years old, seven to nine years old, and ten years old and older. On the basis of the data from the questionnaire, it would have been possible to further distinguish groups ten to twelve years old and thirteen years old and older, but since the group thirteen years old and older contained a very small number of respondents (116, i.e. 1.8%), these groups were merged into a single category of ten years old and older.

The results of differences in the individual analyzed variables in connection to the listed age groups are shown in Table 7.2. The table shows that almost 10% of Czech children started using digital technologies before they were three years old; approximately 37% between the ages of four and six, approximately 40% between the ages of seven and nine; and over 12% when they were ten years old or older. The table shows an unambiguous trend for almost all analyzed variables, in which the average value of the given variable decreases with every higher age group. If we take ICT competence as an example, we can see that while in the lowest age group (three years old and younger), the average level of ICT competence is 0.19, in the group of four- to six-year-olds, the level of ICT competence is already at −0.09. In the oldest age group (ten years old and older), the ICT competence reaches an average of −0.34. Thus it seems that the level of ICT competence of fifteen-year-old students differs significantly based on the age at which they started using digital technologies. Specifically, the listed trend suggests that the later children start using digital technologies, the lower their digital competence is at the age of fifteen. A similar trend is also visible with ICT autonomy and other analyzed variables. To determine whether these differences are statistically significant while considering other variables, we performed a multilevel modeling and mediation analysis.

In order to perform the mediation analysis and answer the first two specific research questions, we first had to create a series of models that allowed us to distinguish between total, direct, and indirect effect of the age at first use of digital technologies on the level of ICT competence and autonomy at the age of fifteen. We summarized the results of the mediation analysis in Fig. 7.2 and Table 7.3.

Table 7.2 Differences in ICT competence, ICT autonomy, ICT use for schoolwork and leisure activities, ICT interest, and ICT in social interaction based on the age at which children started to use digital devices

	3 years old and younger		4–6 years old		7–9 years old		10 years old and older	
	N (%)	M (SD)	N (%)	M (SD)	N (%)	M (SD)	N (%)	M (SD)
ICT competence	589	0.19	2210	−0.09	2399	−0.30	764	−0.34
	(9.9)	(1.14)	(37.1)	(0.90)	(40.2)	(0.85)	(12.8)	(0.88)
ICT autonomy	586	0.22	2218	−0.04	2388	−0.28	759	−0.34
	(9.8)	(1.10)	(37.3)	(0.89)	(40.1)	(0.83)	(12.8)	(0.88)
ICT use for schoolwork	590	0.07	2257	−0.07	2437	−0.13	773	−0.04
	(9.7)	(1.29)	(37.3)	(0.98)	(40.2)	(0.89)	(12.8)	(1.03)
ICT use for leisure activities	604	0.33	2330	0.10	2517	−0.08	808	−0.15
	(9.7)	(1.30)	(37.2)	(1.0)	(40.2)	(0.90)	(12.9)	(0.99)
ICT interest	594	0.11	2244	−0.10	2432	−0.34	775	−0.41
	(9.8)	(1.22)	(37.1)	(0.91)	(40.2)	(0.79)	(12.8)	(0.87)
ICT in social interaction	580	0.19	2201	−0.12	2368	−0.31	746	−0.30
	(9.8)	(1.16)	(37.3)	(0.96)	(40.2)	(0.93)	(12.7)	(0.98)

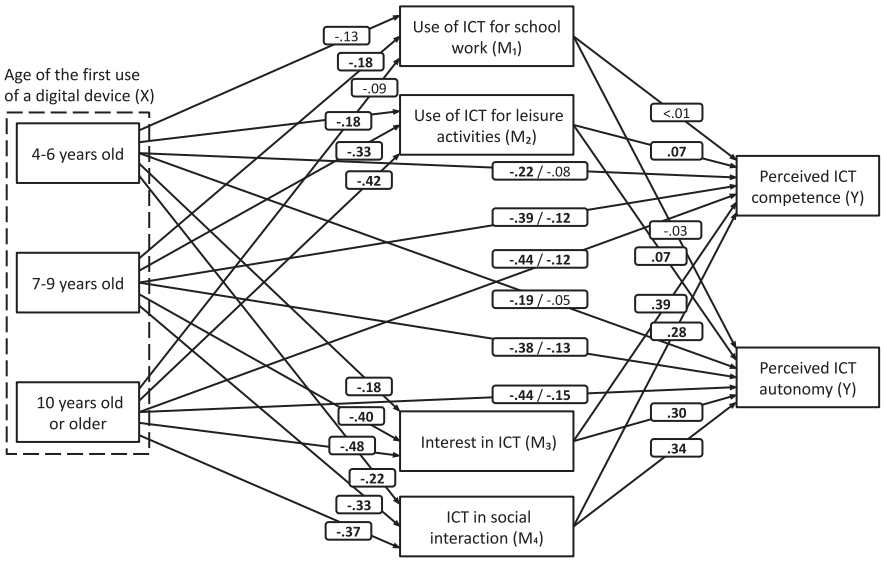

Fig. 7.2 A statistical diagram of the parallel multiple mediator model for the presumed influence of the age at first use of a digital device on the perceived ICT competence and ICT autonomy

Table 7.3 Relative total, direct, and indirect effects for the models with the age of the first use of a digital device as the antecedent and ICT competence and ICT autonomy as the dependent variables

	ICT competence	ICT autonomy
	Effects (SE)	Effects (SE)
Relative total effects		
4–6 years old	−0.224 (0.062)***	−0.191 (0.053)***
7–9 years old	−0.388 (0.062)***	−0.378 (0.057)***
10 years old and older	−0.443 (0.076)***	−0.443 (0.071)***
Relative direct effects		
4–6 years old	−0.079 (0.044)	−0.051 (0.037)
7–9 years old	−0.121 (0.047)*	−0.127 (0.045)**
10 years old and older	−0.123 (0.057)*	−0.146 (0.051)**
Relative indirect effects		
4–6 years old → Use of ICT for schoolwork	0.001 (0.003)	0.003 (0.003)
7–9 years old → Use of ICT for schoolwork	0.001 (0.003)	0.005 (0.004)
10 years old and older → Use of ICT for schoolwork	<0.001 (0.002)	0.002 (0.003)
4–6 years old → Use of ICT for leisure activities	−0.012 (0.006)*	−0.012 (0.006)*
7–9 years old → Use of ICT for leisure activities	−0.022 (0.007)**	−0.023 (0.008)**
10 years old and older → Use of ICT for leisure activities	−0.028 (0.009)**	−0.029 (0.009)**
4–6 years old → Interest in ICT	−0.070 (0.027)**	−0.053 (0.020)**
7–9 years old → Interest in ICT	−0.156 (0.030)***	−0.119 (0.023)***
10 years old and older → Interest in ICT	−0.188 (0.038)***	−0.143 (0.029)***
4–6 years old → ICT in social interaction	−0.061 (0.016)***	−0.074 (0.019)***
7–9 years old → ICT in social interaction	−0.094 (0.018)***	−0.114 (0.022)***
10 years old and older → ICT in social interaction	−0.104 (0.020)***	−0.126 (0.024)***

*p < 0.05 **p < 0.01 ***p < 0.001

The first research question concerns total and direct effects. In Fig. 7.2, these are listed next to the arrows aimed from the individual age groups toward ICT competence or ICT autonomy (i.e. toward the dependent variables). Total effect is listed before the slash; direct effect is listed after the slash; and bold text signifies statistical significance. Similar information in a more detailed form is listed in Table 7.3. The presented results confirm the trend that the children who start using digital devices at a later age achieve lower levels of ICT competence and ICT autonomy by the age of fifteen. In comparison to children who start using digital technologies for the first time at the age of three or younger, children starting with digital technologies at the age of four to six years of age achieve on average ICT competence levels lower by 0.22 and ICT autonomy levels lower by 0.19 at the age of fifteen. For children starting with digital technologies at the age of seven to nine, the decrease is 0.39 in ICT competence levels and 0.38 in ICT autonomy by the age of fifteen, and in children using digital technologies after ten years of age, the total effect reaches −0.44. All the listed total effects are statistically significant.

Results similar to total effects can also be seen with direct effects, which consider the effect of other ICT-related variables entering the models. As both Fig. 7.2 and Table 7.3 show, for all age groups, the direct effects are significantly lower than the total effects and a statistically significant difference in comparison to the lowest group appears only in the seven to nine age group. This suggests that the age at the first use of digital technologies affects the development of digital competence and autonomy directly and also implicitly through other analyzed variables. The effect of the age at the first use of digital devices nevertheless remains a statistically significant predictor of the ICT competence and autonomy at the age of fifteen.

The indirect effects reported in the table can be used to answer the second research question concerning the degree to which the variables ICT use for schoolwork, ICT use for leisure activities, ICT interest, and ICT in social interaction function as mediators of the relationship between the age at which Czech children start using digital technologies and the level of their digital competence and autonomy at the age of fifteen. Focusing on the p-values marking statistical significance reveals that three out of four variables in the considered model are significant mediators. The degree of use of ICT in the home environment for school purposes does not manifest itself as a mediator in the analyzed relationship and even the variable alone is not significantly related to ICT competence or autonomy (see Fig. 7.2). It seems that the use of digital technologies for school purposes does not contribute to the development of digital competence and autonomy for children and adolescents. On the contrary, the frequency of use of digital technologies for leisure activities, interest in ICT, and the degree to which digital technologies play a role in everyday social interactions seem to significantly affect the development of digital competence and autonomy. On the basis of the value of the listed indirect effects, the main role is probably played by the variables ICT interest and ICT in social interaction.

7.3 The Effect of the First Use of the Internet on Digital Competence and Autonomy

For the variable concerning the first use of the Internet, the relevant question in the questionnaire was answered by 6534 students, which represents 93.1% of the total number of 7019 students participating in the PISA 2018 research in the Czech Republic. A total of 20 (i.e. 0.3%) of those students selected the option stating that they had never used the Internet. These students were excluded from this analysis and the final sample thus amounted to 6514 students. In comparison to the previous chapter, we only worked with three age groups, specifically: six years old and younger, seven to nine years old, and ten years old and older. The reason for the consolidation of the categories three years old and younger and four to six years old into a single category labelled six years old and younger was the rather low representation of respondents (155, i.e. 2.4%) who stated that they started using the Internet at the age of three or earlier. In other aspects, the analysis was performed as before, using the variable concerning the age at the first use of a digital device.

Table 7.4 Differences in ICT competence, ICT autonomy, ICT use for schoolwork and leisure activities, ICT interest, and ICT in social interaction based on the age when children started to use the Internet

	6 years old and younger		7–9 years old		10 years old and older	
	N (%)	M (SD)	N (%)	M (SD)	N (%)	M (SD)
ICT competence	1328	0.03	2757	−0.20	1863	−0.29
	(22.3)	(1.02)	(46.4)	(0.88)	(31.3)	(0.88)
ICT autonomy	1329	0.10	2750	−0.17	1856	−0.30
	(22.4)	(1.01)	(46.3)	(0.85)	(31.3)	(0.86)
ICT use for school work	1338	−0.03	2793	−0.08	1912	−0.10
	(22.1)	(1.15)	(46.2)	(0.92)	(31.6)	(0.95)
ICT use for leisure activities	1385	0.22	2876	0.01	1979	−0.12
	(22.2)	(1.17)	(46.1)	(0.93)	(31.7)	(0.93)
ICT interest	1341	−0.02	2787	−0.20	1902	−0.38
	(22.2)	(1.06)	(46.2)	(0.86)	(31.5)	(0.82)
ICT in social interaction	1316	0.07	2716	−0.21	1845	−0.34
	(22.4)	(1.06)	(46.2)	(0.93)	(31.4)	(0.96)

We list the descriptive table (see Table 7.4) presenting the results in the average values of both dependent variables and all four analyzed mediators in dependence on the individual age groups. As the table clearly shows, approximately 22% of Czech children started using the Internet at or below the age of six, approximately 46% of children started using the Internet between seven and nine years of age, and less than 32% started at the age of ten or older. Similarly to the first use of digital technologies, we can see a clear negative connection between the age at the first use of the Internet and the individual analyzed variables. This means that the children who started using the Internet at a later age achieve lower levels of digital competence and autonomy at the age of fifteen, but they also use digital technologies less (both for school purposes and for leisure activities), they are less interested in digital technologies, and the digital technologies generally play a smaller role in their everyday social interaction. If we take ICT autonomy as an example, then for the lowest age group (six years and younger), the children achieve the value of 0.10 in the autonomy in the use of digital technologies at the age of fifteen, while the children starting with the Internet between seven and nine years of age achieve on average − 0.17, and the children using Internet for the first time after the age of ten achieve −0.30. In order to confirm this trend, we have to use modeling and statistical testing in the next step.

The results of the mediation analysis, which allow us to answer the third and fourth research questions, are presented in the form of a statistical diagram (Fig. 7.3) and the subsequent table with total, direct, and indirect effects (Table 7.5). We can see from the diagram and table that the results concerning the age at the first use of the Internet largely replicate the results of the previous analyses using the age at the first use of digital technologies as the main independent variable. However, there are some differences. For example, if we focus on digital competence, only total effects

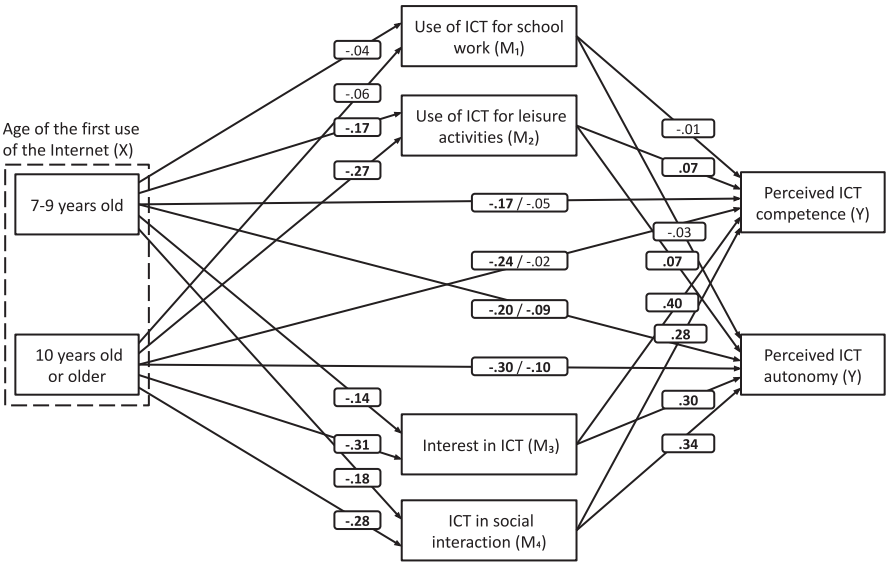

Fig. 7.3 A statistical diagram of the parallel multiple mediator model for the presumed influence of the age at first use of the Internet on the perceived ICT competence and autonomy

Table 7.5 Relative total, direct, and indirect effects for the models with the age of the first use of the Internet as the antecedent and ICT competence and ICT autonomy as the dependent variables

	ICT competence	ICT autonomy
	Effects (SE)	Effects (SE)
Relative total effects		
7–9 years old	−0.170 (0.034)***	−0.204 (0.038)***
10 years old and older	−0.237 (0.040)***	−0.305 (0.042)***
Relative direct effects		
7–9 years old	−0.053 (0.029)	−0.092 (0.032)**
10 years old and older	−0.020 (0.032)	−0.103 (0.033)**
Relative indirect effects		
7–9 years old → Use of ICT for schoolwork	<0.001 (0.001)	0.001 (0.001)
10 years old and older → Use of ICT for schoolwork	<0.001 (0.001)	0.002 (0.002)
7–9 years old → Use of ICT for leisure activities	−0.012 (0.004)**	−0.011 (0.004)**
10 years old and older → Use of ICT for leisure activities	−0.019 (0.005)***	−0.019 (0.006)**
7–9 years old → Interest in ICT	−0.057 (0.018)**	−0.043 (0.014)**
10 years old and older → Interest in ICT	−0.123 (0.022)***	−0.094 (0.017)***
7–9 years old → ICT in social interaction	−0.050 (0.012)***	−0.060 (0.014)***
10 years old and older → ICT in social interaction	−0.080 (0.013)***	−0.096 (0.016)***

*p < 0.05 **p < 0.01 ***p < 0.001

are statistically significant; direct effects are no longer statistically significant. It seems that in this case, the age at which children start using the Internet is not directly connected to the development of digital competence, but only implicitly connected through other ICT-related variables. Thus we can speak of a complete mediation. By contrast, as regards autonomy in the use of digital technologies, direct effects remain statistically significant, thus it is only a partial mediation.

For indirect effects, Table 7.5 clearly shows that the variable concerning the use of digital technologies in the home environment for school purposes still does not function as an important mediator of the relationship between the age at which children start using the Internet and the level of their digital competence and autonomy at the age of fifteen. On the contrary, the remaining three variables (i.e. ICT use for leisure activities, ICT interest and ICT in social interaction) are statistically significant mediators both for digital competence and for autonomy in the use of digital technologies. In comparison to the model containing the age at the first use of digital devices (i.e. Table 7.3) as an independent variable, the indirect effects in the model with the first use of the Internet variable are slightly lower, especially for ICT autonomy.

7.4 Conclusion

This chapter investigated the connection between the age at which Czech children start using digital technologies and the Internet and the level of their digital competence and autonomy at the age of fifteen. We presumed that the monitored relationship might also be significantly affected by other ICT-related variables, such as the frequency of use of digital technologies (whether for school purposes or during free time), the interest in digital technologies, and the degree to which digital technologies play a role in the everyday social interactions of children and adolescents. In order to answer the set questions, we used a mediation analysis that allowed us to distinguish between direct and indirect effects and to identify which of the considered variables act as important mediators of the relationship between the age at the first use of digital technologies or the Internet and the level of digital competence and autonomy of adolescents at the age of fifteen. In the analyses, we used data on the Czech Republic from the PISA 2018 research.

The results of the performed analyses present several important findings. First and foremost, there is an important connection between the age at which children start using digital technologies (research question 1) and the Internet (research question 3), and their digital competence and autonomy at the age of fifteen. However, this connection is negative, which means that the later children start using digital devices and the Internet, the lower the level of digital competence and autonomy they achieve at the age of fifteen. The results comply with some previous studies (Deursen & Dijk, 2011; Deursen et al., 2011; Hatlevik et al., 2018; Livingstone & Helsper, 2007), as well as with our previous study, which used data from the PISA 2015 research and focused on the age at which children start using a personal

computer (see Juhaňák et al., 2019). Thus it seems more and more important to pay attention to very small children in connection to the development of digital literacy, particularly as a number of children start using digital technologies and the Internet at preschool age, or even when three years old and younger. The trend of younger and younger children using digital technologies (comp. Chaudron, 2015; Chaudron et al., 2018; Holloway et al., 2013) can be expected to continue.

The second pivotal discovery of this chapter is that even though there is a significant connection between the age at which children start using digital technologies and the Internet and their subsequent digital competence and autonomy at a later age, this connection is significantly mediated by other ICT-related variables. Apart from the direct effect of the age at first use of digital devices and the Internet on the level of ICT competence and autonomy at the age of fifteen, there are also important indirect effects in play that seem even stronger than the direct effects. The age at which children start using digital technologies (including the Internet) is therefore important for the development of digital competence and autonomy largely because of its relation to other ICT-related variables, which subsequently lead to the development of digital competence and autonomy of children and teenagers. The children who start using digital technologies and the Internet at earlier ages are on average more interested in digital technologies at a later age and they use them more frequently in their free time or within everyday social interactions. This is subsequently reflected in their better digital skills.

In connection to the second and fourth research questions, we specifically focused on the four potential mediators of the relationship between the age at the first use of digital technologies and the Internet and the subsequent degree of ICT competence and autonomy at the age of fifteen. These were: use of ICT for schoolwork, use of ICT for leisure activities, interest in ICT, and ICT in social interaction. The results of the mediation analysis showed that the variables use of digital technologies for leisure activities, interest in digital technologies, and ICT in social interactions played roles as important mediators, in connection to both digital competence and autonomy in the use of digital technologies. The use of digital technologies for school purposes was not revealed to be an important mediator, nor was this variable significantly connected to the level of digital competence and autonomy. Thus it seems that the use of digital technologies for school purposes does not significantly contribute to the development of digital competencies of children and adolescents. These findings correspond significantly with the results in Chaps. 4 and 5 as well as with the results of other studies. Aesaert et al. (2015) and Hatlevik et al. (2018) concluded that it is primarily the out-of-school factors that participate in the development of digital competence (or possibly autonomy), and that the school factors explain very few differences in the digital competence and autonomy of students.

There are several possible explanations for the low effect of school on the development of the digital skills of children and adolescents. According to Aesaert et al. (2015), digital technologies are not being used to such an extent in schools as to have a recognizable effect upon the development of digital competence and autonomy. Another explanation is offered by the results presented Chap. 3, in which we

showed that the use of digital technologies in Czech schools is rather limited and often built on the transmissive mode of teaching and a limited use of more advanced digital technologies directly in lessons (for example, the use of shared documents for cooperation in a group or creative use of digital technologies). Thus the main point of concern is probably not how often or how intensively digital technologies are used in schools, but rather for what purposes and in what ways they are used. These may be such educational activities and manners of use that do not tend to lead to developing digital competences. Incidentally, a number of studies and experts have pointed out the significant differences in the use of digital technologies inside and outside of the school environment. Murphy and Beggs (2003) asserted that a very important difference lies in the management of activities consisting of when they want to buy a new game or a piece of digital technology technology use. While in school, these activities are strictly delimited, controlled, and inspected by the teacher, in the home environment, children or adolescents are able to control these activities and manners of use of digital technologies themselves. This allows them to experiment with digital technologies and to investigate various options for their use, which is reflected positively in the development of digital competencies. Similarly, Chaudron et al. (2018) stated that in the use of digital technologies, the children are primarily self-explorers and self-learners and they learn through the trial-and-error method, which further supports the development of skills as well as autonomy in the use of digital technologies.

Last but not least, the results of the performed analyses suggest that even though the same mediators are statistically significant in both digital competence and autonomy, the size of the indirect effects differs for the individual mediators. The individual ICT-variables participate in the development of digital competence and autonomy to varying degrees. The effect of the frequency of use of digital technologies for leisure activities seems rather small in comparison to interest in digital technologies and the use of ICT within everyday social interaction. While for digital competence development, the interest in digital technologies seems to play the primary role, the development of ICT autonomy is apparently similarly connected to the degree to which the digital technologies form a part of everyday social interaction of children. The stronger roles of the interest in digital technologies and ICT in social interactions variables compared to the frequency of use of digital technologies may seem surprising. However, some studies have indicated the importance of these variables for the development of digital skills. Alkan and Meinck (2016) discovered a significant positive connection between the use of ICT for social communication and the results of the students in a computer and information literacy test. Christoph et al. (2015) found a significant positive connection between ICT-related social engagement and theoretical knowledge in the field of computers and at the same time between the interest in computers and the level of basic computer skills.

On the other hand, the weaker effect of the frequency of use of digital technologies in free time upon the development of digital competence and autonomy might be due to the nature of this variable itself, i.e. by the fact that this concerns the frequency of the use of digital technologies. As we suggested at the beginning of this

chapter in connection to the use of digital technologies during free time, the situation might occur in which the total frequency or intensity of use might be less important than the contexts and activities within which the children and adolescents use the digital technologies in their free time. Here, we reach the clear limits of the quantitatively oriented approach used in this chapter. Therefore, a more detailed study of the various manners of use of digital technologies by adolescents is the subject of interest in the qualitatively oriented Chap. 8.

Appendix

Table 7.6 Correlation matrix of the variables used in the analysis

	1.	2.	3.	4.	5.	6.	7.
1. Perceived ICT competence	1						
2. Perceived ICT autonomy	0.658***	1					
3. Use of ICT for schoolwork	0.201***	0.181***	1				
4. Use of ICT for leisure activities	0.361***	0.358***	0.452***	1			
5. Interest in ICT	0.553***	0.500***	0.217***	0.402***	1		
6. ICT in social interaction	0.513***	0.557***	0.277***	0.397***	0.411***	1	
7. Index of economic, social, and cultural status	0.027*	0.055***	0.032	−0.027	−0.025	−0.057***	1

*p < 0.05 **p < 0.01 ***p < 0.001

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Chapter 8
Digital Technologies and the Everyday Lives and Learning of Present-Day Adolescents

Abstract This chapter focuses on the manner in which digital technologies affect the lives of adolescents, how the digital technologies are accepted or rejected, and how they are used in daily life and learning. The findings complement and deepen the knowledge presented in the previous chapters. The topic is anchored in several theoretical frameworks presented in the introductory section. We focus on the concept of everydayness; we also explain the concept of the domestication of digital technologies and the concept of learning lives, with consideration for the use of digital technologies in learning both in and out of school. We also present various forms of informal learning, including intergenerational learning.

The chapter presents the results of our qualitatively oriented research. We describe and explain the lives and learning of our respondents, particularly with digital technologies. We present six insights into the lives of Czech adolescents whose lives and learning illustrate the metaphor "ICT is a good servant but a bad master." We conclude the chapter by putting the results into wider contexts.

Keywords Adolescents · Domestication of digital technologies · Everydayness · Learning · Learning lives · Informal learning · Intergenerational learning · Out-of-school environment

8.1 Theoretical Background

Adolescence can be perceived as the bridge between childhood and adulthood (Macek, 2003). In our research, we captured the life of fifteen-year-old students with digital technologies. Through in-depth interviews, we were also able to learn about their childhoods with digital technologies. The results of our research thus provide a detailed and contextually anchored image of the everyday life of present-day teenagers and the role of digital technologies in it.

In the Czech Republic, a large change in the education pathway occurs in adolescence. At the age of fifteen, students are at the end of primary school or in the fourth

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year of an eight-year gymnasium or the second year of a six-year gymnasium. Students of gymnasiums usually continue the same school and class; the students of primary schools end their studies at this point and have to decide whether to continue their studies at a four-year gymnasium, a secondary technical school, or a secondary vocational school (the Czech education system is presented in greater detail in Chap. 2). A transfer to a new school usually brings a number of changes. In addition to new teachers and a different or more difficult subject matter, the students have to deal with a new body of peers and often also a commute. Existing contacts with friends can be broken; at the same time, new friendships can form at the new school. Relationships with friends are especially important at this time of life, because within these relationships, the adolescents learn ways to solve conflicts, they learn compassion and empathy, and they learn to give and receive social feedback (Smetana et al., 2005). During adolescence, mutual trust between friends strengthens. The friendship and peer culture assist in better self-discovery through mutual interactions and reflections.

Pasquier (2008) warned that mobile technologies and the Internet have provided young people with a larger degree of autonomy in peer relationships. Because of digital technologies, adolescents can establish contact with peers outside of the family without being under direct control of their parents. According to Pasquier, adolescents consider face-to-face communication to be the most valuable, but the online space is very important for the expression of their own self, which is in this way constantly in contact with peer groups in which discussions or various sharing of content and information take place. In the online space, these processes are often very dynamic, and, for example, reactions to posts come very quickly. News then spreads at lightning speed within the given group or community.

Digital technologies have become one of the important formative elements of the everyday lives of young Czech people. The *everydayness* is interconnected with historical, social, and economic contexts, but also with the material environment in which the individual lives and that they co-create and propel with their actions and interactions with others and their surroundings (De Certeau, 1988; Macek, 2015; Schutz & Luckmann, 1974). Everyday use of digital technologies leads to the creation of new forms of actions and interactions; it therefore has a significant impact upon the spatial and temporal organization of life and on the formation of social reality, because the spatial distance does not necessarily have to mean a temporal delay (Thompson, 2004).

Consideration of everydayness necessarily involves interest in daily life, in the various routines, rituals, traditions, and myths (Silverstone, 1994), and in the role that digital technologies and the related practices play in daily life and its routines (Macek, 2015). The existing studies suggest that adolescents (and other users) "personalize" digital technologies through their everyday activities. They use digital technologies for their own purposes, often very distant from what their creators presumed. On the other hand, these technologies sometimes alter the structure of everyday life, in which the users, often unknowingly, adapt the structure of their everyday life to digital technologies (Bakardjieva, 2005).

To map the role of digital technologies in the everyday life of adolescents, the question is how to view and theoretically grasp the "effects" that digital technologies have on their daily life. The concept of the *domestication* of digital technologies (Silverstone, 1994) seems applicable in this context. This domestication denotes a process in the course of which the users encounter ICT in various environments and integrate them into their everyday structure, routines, and values and the digital technologies become a part of their environment (for example, a household). If the domestication is successful, the digital technologies are not perceived as problematic or alien; they are useful tools. However, the complete and completed "taming" of ICT is rarely achieved, because the digital technologies themselves and the needs of the users change constantly; re-domestication and de-domestication occurs. This is a constant dynamic process during which people and digital technologies create and transform the environment in which the digital technologies mediate more and more interactions between people as well as interactions with the environment. Importantly, this concerns not only people adapting digital technologies, but also people using domestication to create environments that are increasingly mediated by digital technologies (Berker, 2006).

As digital technologies change and develop, so does the research in this field. The original concept of domestication was connected to the expansion of television into households, but digital (interactive) technologies gradually came to also be viewed through the lens of domestication. A 2012 study by Courtois and his colleagues emphasizing the role of context showed an interesting development of the original concept of domestication. Domesticated digital technologies emerged as contextually anchored elements participating in social relationships. Therefore, digital technologies must be perceived as commodities whose meaning differs in accordance with the existing context. For example, a mobile phone can be used for various practices within a specific social context, and again differently (or identically) within a different social context (Courtois et al., 2012).

Apart from the everydayness itself and the role of digital technologies in the daily life of Czech adolescents, our research considered the specific learning problems of present-day teenagers, which is of course an integral and important part of their everydayness. The main questions concern how digital technologies affect adolescent learning, what role learning with digital technologies plays within the everyday activities of young people, and the ways in which digital technologies are used in various learning contexts, how important the context actually is, how adolescents personalize their devices for various learning situations, and how digital technologies co-create the everydayness of adolescents.

We use our previous considerations as a starting point for holistic thoughts about learning in the lives of young people. Starting with considerations about everydayness and domestication of digital technologies means that the problems with the use of digital technologies in connection to learning cannot be narrowed only to formal learning, meaning to learning in school (see also Chaps. 5 and 6). It is necessary to also focus on learning outside of school in various contexts and environments, both offline and online. We thereby attempt to overcome the frequently limited focus on

ICT only in formal education, sometimes referred to as the "classrooms-as-container" discourse (Leander et al., 2010).

Our research builds on the approach referred to as *learning lives*, which reflects the need "to move beyond traditional conceptions of formal versus informal ways of learning and literacy" (Erstad, 2012, p. 26). This approach was used by Biesta and Tedder within the *Learning Lives: Learning, Identity and Agency in the Life-Course* project (Biesta & Tedder, 2007), in which they tried to capture the learning processes of adults in the course of their lives in various life situations, in the most complex way possible, while using a number of research methods. This project is an important inspiration for the learning lives approach, which understands learning as a part of various daily social contexts that students or young people live in (Erstad, 2013; Erstad et al., 2009).

The learning lives approach helps identify the learning styles of young people within and among the various places in which learning takes place. The learning lives approach also inspires consideration of the role that a person's individual "history," including their experience with digital technologies, plays in the formation of their experiences with learning; this individual history is part of the wider historical and cultural framework. Such an approach leads to an improved knowledge of life and learning including continuities and discontinuities between the school and out-of-school environment (Erstad, 2015). Erstad (2012) explained:

> At home, they use more advanced digital software and tools than in school, more often, and for a broader set of different activities. This does not necessarily mean that technology use inside schools should be like technology use outside school. The objectives are different, but we need to know how this difference is experienced by students and how activities in one context might relate to activities in another context (p. 27–28).

We build on the assumption that formal and informal learning cannot be viewed strictly separately. Formal learning does not occur exclusively in school education, and informal learning does not take place only outside of school. It is important to search for mutual relationships between the processes of formal and informal education in various situations or environments (Colley et al., 2002). For example, in a classroom, typically a site of formal learning, various forms or elements of informal learning take place with digital technologies directly during lessons or outside of lessons, such as during school breaks in conversations with both friends and teachers or within discussions about various technological tools. Similarly, various forms of purely formal learning take place outside of the classroom or school, such as during student preparation for school, including doing homework, preparing for exams, and testing. There are various elements of informal learning, including searching for information in various sources (home library, the Internet), but there is also the option of consulting other members of the household or drawing inspiration from their experiences. Learning methods that are part of school education, such as drills and practice, can also appear within informal learning in some hobbies, such as in sports or household repairs.

In this regard, it is interesting to think about the teacher, who is missing from informal learning. Outside of formal settings, the role of the teacher can be played

by other people who do not have a pedagogical education but are experts on certain topics, or by the digital technologies themselves. The question remains of how, where, and with what goals such learning takes place and in what processes or elements of formal and informal learning the "teacher" is present. This answer can be very important for informal learning with ICT (Sefton-Green, 2004).

In their study, Furlong and Davies (2012) focused on the problems of informal learning at home with ICT. They presented three basic groups of informal learning practices with ICT. The first group is *resources for learning*; it includes various types of digital sources that may support or affect young peoples' learning. It may concern digital resources such as websites of various institutions (televisions, radios, museums) or sources the students have available on their devices that can be sent or shared. The sources include digital resources, and the authors also incorporate social resources into this group, including friends or various on/offline networks. Time is an important but often forgotten source. By this, the authors refer to individuals' ability to control or regulate their time. Especially in younger children, this may concern a certain period of time spent with digital technologies determined by their parents (see also Chap. 6 and parental regulations).

The second group is *ways of learning*, which includes digital technology tools enabling (access to) learning, which differs from the traditional concept of learning based on the written word. This may include various forms of a "game" in which young people "play" with various ICT tools, such as hardware or software, in various ways. The trial and error approach to learning to use digital technologies may represent another example. This group also contains various forms of observation or expert performance modeling. This may concern a simulation of some procedure or repair/production of some item, such as cooking or repairing a computer. However, the copied process may still be somewhat enriched or improved and further shared via social networks (producing, reviewing and re-producing) thanks to the Internet. Into this group, the authors classify various joint activities of individuals based on joint or shared work based on social networks or services allowing sharing of, for example, video (sharing, co-production). Various results of one's own creation or co-created videos as well as new applications, texts on the Internet, and presentations created within various hobbies can be created, shared, or commented on, and peers or family members can participate in the creation.

Skills to support learning is the third group of informal learning practices with ICT in the home that Furlong and Davies wrote about in their study. It includes adoption or use of technical skills in the field of digital technologies, in which the young people manage to use many applications or digital technologies. It also includes the abilities to evaluate the quality of information acquired from digital sources as well as network skills. Many activities take place within social contexts, and young people use these skills in a range of situations. Collaborative skills, which permeate many (learning) activities of young people, represent an important part of informal learning practices. The authors gave the example of playing games, in which a respondent to their research played a game with players from all around the world and thus it was necessary to cooperate with people, only some of whom were friends. People can then use these collaborative skills in other activities as

well, even in traditionally oriented learning (shortened and edited according to Furlong & Davies, 2012).

Intergenerational learning, whose basic distinctive feature in comparison to other types of learning is its focus on participants of learning coming from different generations, can be a specific form of informal learning. This may concern either two consecutive generations or every other generation (Rabušicová et al., 2009). We partially approached this topic in Chap. 6, in which we mentioned especially the parent-child relationship and their mutual learning (Domínguez, 2012).

Intergenerational learning is a traditional part of family life and thus it is not a new phenomenon, but it transformed with the arrival of digital technologies. The traditional learning model, in which the parents or grandparents teach the children, may not apply at all with digital technologies. On the contrary, both grandparents and parents acquire abilities and knowledge about ICT from their offspring (Age Concern, 2009; Tambaum & Normak, 2018).

Learning does not only take place from parents to children, but also from children to parents, and the role of parents therefore need not be nearly as dominant as it was in the past (Kamanová, 2009). With regard to the aging population, this transfer also extends to the generation of grandparents, even when all the generations do not live in a single household. The youngest generation sometimes becomes the family experts on digital technologies (Erstad, 2012), and they can help and give advice to others and teach them.

Various forms of intergenerational learning may contribute to improving relationships between the members of individual generations and lower the barriers created by the very fast development and use of digital technologies. Such learning develops digital literacy in the older members of the household and supports their active aging, learning in other fields, and joy from life. Young people learn to communicate with older people in the course of intergenerational learning, they understand the older generation better, leave intergenerational learning sessions with positive feelings, and also develop their own abilities in the use of digital technologies. This is sometimes referred to as intergenerational solidarity (Azevedo & Ponte, 2020). Intergenerational learning can lead to diminishing the risks of generational conflict (Patrício & Osório, 2016), even in the field of digital technologies, which can be a cause of these disagreements (see Chap. 6).

The theoretical considerations presented in the introduction lead us to the main goal of this chapter, which is the mapping and explanation of how digital technologies affect the lives of the adolescents, how digital technologies are accepted or rejected by them, and how they are used. We aim to capture the manner in which digital technologies are viewed by the adolescents themselves. We also aim to map the various forms of adolescent learning with the support of digital technologies. We asked the following questions:

- What digital technologies do adolescents use in daily life?
- In what ways do adolescents use digital technologies?
- How do adolescents use digital technologies for their learning?

We acquired the answers to our questions using a qualitative analysis of semi-structured interviews with six adolescents. Two interviews were conducted with each adolescent. The introductory interview was aimed at discovering how digital technologies are viewed by the adolescents, what role these technologies play in their lives, and how digital technologies are domesticated. At the end of these interviews, the adolescents were given a "week-long homework" assignment. In as much detail as possible every thirty minutes, the adolescents were to fill into a record sheet of what digital technologies they used and what for over the course of a regular week. The record sheet was the basis for the second interview, the goal of which was to reveal the manners of use of digital technologies in more detail and to learn the specific activities for which the adolescents used the digital technologies. In reality, our respondents commented on their week-long record and the studies asked complementary questions, if necessary. The second interview also included clarifications of topics from the first interview that were unclear to the researchers or that represented new information suitable for more detailed discussion with the respondent.

After all the interviews were transcribed, we approached two phases of qualitative analysis. First, we inductively coded all the interviews (Charmaz, 2006; Strauss & Corbinová, 1999; Švaříček & Šeďová, 2007) with the goal of discovering all the topics that were revealed as important in the adolescents' lives in connection to the use of digital technologies. On the basis of the similar content of codes created in this manner, five categories were created; the adolescents' varying extents and manners of use of the digital technologies were classified within the framework of these five categories. This concerns *use of digital technologies in connection to family*, *for orientation in the world*, *for school purposes*, *for peers*, and *for oneself.* Since the interviews with our respondents uncovered a bright palette of use of digital technologies and we were not always able to find completely identical categories, we approached the second phase of interview analyses. In this phase, we coded all the interviews again, but this time we used a deductive approach with the steps of summative content analysis of texts (Babbie, 1992; Catanzaro, 1988; Hsieh & Shannon, 2005; Morse & Field, 1995), which allowed us to focus on the process of content interpretation and on independent words or phrases from the recorded interviews and their relationship to the five detected categories rather than on the analysis of data as a whole. The five categories presented above were the starting categories.

In this chapter, we introduce six adolescents' stories and focus on a specific use of digital technologies in connection to the five categories. The data from the record sheets were divided into the five identified categories. They were then processed into tables in the MS Excel program (including the duration of the given activity). These tables were turned into the graphs attached to each of the stories. In this way, we acquired a clear depiction of the duration of the individual activities in the course of a week, which plastically documents the everydayness of the adolescents with digital technologies.

8.2 ICT as Both a Good Servant and a Bad Master in Adolescents' Lives

The results of the interview analyses brought us to a metaphor capturing the presence of digital technologies in the lives of Czech adolescents, which appears in various forms within the everydayness of the adolescents' lives and which has to be taken with a grain of salt at the same time: *a good servant but a bad master.* In the original meaning, the parable refers to fire as a good servant but a bad master. In principle, the parable expresses that anything too powerful is dangerous, even though while it only serves and is fully controlled by people, it can be necessary and advantageous. Digital technologies may be classified among such things. In order to be able to distinguish a "good servant" from a "bad master" in the use of digital technologies, we have to focus on a broader picture, on the context in which the digital technologies are used, on the manners of this use, and on the perceived degree of their use. This chapter aims to achieve a detailed insight into the adolescents' lives with digital technologies and on the basis of the discovered context, the manner of use of ICT or the perceived degree of this use, we identify cases in which digital technologies play the role of a good servant in adolescents' lives (they are fully and intentionally controlled by the adolescents) and when they can be considered a bad master (the adolescents tend to be controlled by digital technologies).

The analyses showed that in each and every one of the presented categories (*use of digital technologies in connection to family*, *for orientation in the world*, *for school purposes*, *for peers*, and *for oneself*), there were identifiable cases in which the digital technologies played the role of a good servant as well as those in which the digital technologies were a bad master. The analyses further suggested that the boundary between these two sides is rather thin. It cannot be said that for some adolescents, the digital technologies are exclusively a good servant and that for others, they are exclusively a bad master. The adolescents often walk a tightrope and balance between the two ill-defined sides. Every adolescent uses digital technologies in a somewhat specific way in their daily life. Our results prove the importance of the context in which the use is affected by the family context or the manner of domestication of ICT in the family as well as the quality of relationships with peers and classmates. The level of difficulty of education at a school and the related demands and expectations connected to adolescent learning can be considered an important context. In the following chapter, we introduce different ways of using digital technologies in the daily lives of six adolescents growing up in varying family contexts, living in various places (village, city), and attending different types of schools.

In addition to the interviews conducted with the adolescents, we used the week-long adolescents' records. These cannot be generalized, and there are clear limitations to this type of data collection, because these records come from respondents with varying approaches, even though the participants were responsible and they completed the records honestly. The records represent another source of data helping to achieve a more detailed insight into the integration of digital technologies into

the everyday activities, routines, or rituals of our respondents. In that way, they represent the depiction of the everydayness of the adolescents and enable the visualization of their activities with digital technologies.

8.2.1 Natalie's Story

Natalie lived in a housing project apartment in a regional capital together with her mother, stepfather, and younger brother. She had a close relationship with her grandmother, who lived one floor above their family. The family was introduced in Chap. 6 within the *deepening the generation gap* type. The text clearly showed that Natalie's relationship with her parents was characterized by frequent conflicts caused by the different views of the use of digital technologies. The parents were convinced that Natalie spent too much time with her mobile phone, which they considered one of the reasons for her worsening grades in her last year of primary school. The parents believed that digital technologies were primarily a bad master for Natalie because she was not able to use digital technologies to what they considered a reasonable degree and she was, in their view, absorbed by them. It was clear from the week-long record sheet that on weekdays, Natalie used her mobile phone to check new messages directly after waking up. However, when she was in school she did not use any digital technologies, neither for her private reasons nor within the lessons. However, she "compensated" for this after school and spent most of her time with her mobile phone. We show the specific purposes of use of the mobile phone in the five following subchapters.

8.2.1.1 Natalie's Use of ICT in Relation to the Family

The research shows that within Natalie's family, the digital technologies represented a tool for strengthening the relationship between the grandmother and Natalie through intergenerational learning. In contrast to Natalie's parents, her grandmother was interested in digital technologies and used them very often. In this regard, Natalie found a shared hobby with her grandmother. Her grandmother wanted to improve her own skills in the use of the Internet and social networks. Because these topics were close to Natalie's heart, she considered her grandmother to be a kindred spirit, and as the following excerpt from her interview proves, she even named her the family expert on digital technologies.

N: Grandmother works with the computer in the office, so she is probably the best in our family in the use of technologies. She doesn't know everything, but especially in the programs, she can work with them. Especially in Excel, Grandma, she likes it the most, she does these tables in it.

I: On the other hand, you are also able to help her with some things, at least with those regarding the mobile phone, does she come to you with anything?

N: Yeah, grandma got a new touchscreen phone, so I taught her how to use it. But she doesn't need a lot. She's happy with making calls, texting, she's also on Facebook, on Messenger, she writes us anywhere she can, but for example, she does not understand mobile Internet and Wi-Fi, I'm helping her with that. And now she can even take a photo of herself, a selfie. She can even take a photo in the mirror without showing her face.

This supports a piece of developmental psychology knowledge that declares that grandparents and grandchildren get along better than parents and children. That is, the grandparents are not afraid to try new and modern things, which makes them younger and "more attractive" than parents in the children's eyes. In contrast to the parents, the grandparents are no longer afraid of endangering their authoritative position (Thorová, 2015; also see Mannheim & Kecskemeti, 1964). This is also proven by Natalie's statement about her parents not asking her for advice regarding the use of ICT despite not being skilled users of digital technologies. They may have considered their lack of knowledge in the field of digital technologies a weakness that they did not want to admit in front of their daughter. In that way, they maintained their status as authoritative "good" parents who know what is best for the child, in contrast to the grandmother who was more "human" and accessible to Natalie because of her approach. Mutual digital technology-supported learning also occurred in the family between Natalie and her younger brother. This did not primarily concern teaching the brother how to use digital technologies, but rather setting rules for sharing one's own photographs or videos on publicly accessible websites. Natalie asked her brother to reflect on which content was suitable or unsuitable for sharing on the Internet to prevent possible mockery, for example of her brother's simple videos.

In relationship to her parents, Natalie mentioned reporting her location or her arrival home to be the most important use of the mobile phone. On one hand, Natalie considered this an advantage that gave her more freedom of movement. For example, she was able to go further away from the house than she could when she did not have the phone. On the other hand, she understood that because of the constant access to the phone, her mother had a constant possibility of control over her. Because of the omnipresent mobile phone and Internet availability, the relationship between Natalie and her mother was characterized by frequent conflicts. Natalie and her mother had different criteria for defining excessive mobile phone use. Natalie believed that she did not differ significantly from her peers in the amount of time spent with digital technologies. Natalie's mother considered Natalie to be addicted to the mobile phone and she tried to limit the time Natalie spent with the mobile phone using various restrictions, as noted in Chap. 6. Natalie perceived her mother's restrictions as inconsistent. In the interview, she made a point about her mother not always carrying out her threats about turning off the wireless Internet, because she knew that she herself needed it, as did the stepfather and the younger brother. Also, Natalie's mother used the Internet (social networks) to give Natalie chores around the house, so she often decided to turn the wireless Internet back on after a while without confiscating Natalie's mobile phone. Natalie believed that at the same time, her mother would have wished for Natalie not to have her own mobile phone at all. "Well, if it was up to her, she would forbid it completely. She would throw the phone

out, throw the laptop out, throw everything out." In connection to her mother's restrictions, Natalie complained about one more thing. The mother did not explain the reasons for forbidding Natalie to spend time with her mobile phone, so Natalie did not understand and it caused confusion:

> She tells me to put the phone away, but she does not tell me why. And often, when she won't let me go outside, I don't have anything to do at home. Well, she tells me: go watch TV. After all, it's the same, it doesn't matter if I'm on the phone or if I watch TV. I am still not doing anything, I am not productive in any way, so why not be on the phone, where I can at least be in touch with someone.

The statement shows that in Natalie's view, the time spent watching television was as unproductive as the time spent with a mobile phone. However, Natalie's mother had reservations primarily about the mobile phone. Natalie explained it as her mother's constant fears about Natalie getting mixed up with a "bad crew." The explanation can also be found in the period in which Natalie's mother grew up. The television was a normal part of her childhood and adolescence, and she did not see any problem with it. On the other hand, mobile phones entered her life only in her adulthood and they were never fully domesticated; she was thus still distrustful of them.

8.2.1.2 Natalie's Use of ICT in Relation to Orientation in the World

In the field of use of digital technologies for orientation in the world, Natalie spoke primarily about searching for public transportation connections on the phone. At the time of the data collection, the family had discussed if they should set up a bank account for Natalie, teach her to use Internet banking, and allow her to shop online. The parents were hesitant about whether Natalie was sufficiently responsible and mature to handle this step toward a more adult life.

Generally, Natalie used the mobile phone the most for communication over social networks and she was therefore warned about the danger of fake accounts or cyberbullying. In this regard, she considered herself careful and cautious, as can be clearly seen:

> For example, I don't text with anyone older who I don't know, but if someone I don't know adds me and I look at their profile and see that they could be the same age as I am and I look at the photos and see that they are there with other people as well and that the photos do not seem fake, I am open to add the person and text with them to a certain degree, unless they want to know things I don't want to tell them.

Even though she was cautious, she was not against communication with strangers and often welcomed it, even though she mentioned that in the offline world, she would not agree to communicate with strangers.

8.2.1.3 Natalie's Use of ICT in Relation to School Purposes Outside of School

Natalie's teachers required only minimum contact with digital technologies from their students, during preparation for lessons or doing homework. Several times a year, Natalie was asked to create a PowerPoint presentation on a set topic, sometimes the students submitted their homework electronically or wrote it on the computer. Natalie did not utilize this option because she did not feel confident when using MS Office so she chose to do her homework by hand almost exclusively.

> I avoid the computer, I don't understand computers at all, so even in school, when we had elective informatics lessons, I did not sign up. It's really kind of … It's not my thing. In only about two subjects, because only for geography, we have this teacher who wants us to do PowerPoint presentations, but other than that, we have teachers who let me do it by hand, so I'd rather write it by hand almost always.

At the same time, Natalie stated that she sometimes uses the Internet in her mobile phone. For example, she used it during her work on a reading diary. Even if she read the book herself, she searched on the Internet to find out what others wrote about it, how the plot of the book was briefly summarized, and so on. She then edited her actual record on the books she read according to this background information. In this regard, digital technologies can simultaneously be seen as a good servant, quickly providing information with minimum effort, but also as a bad master, supporting Natalie's indolence and allowing her to somewhat circumvent or even cheat on the homework she was to do on her own without inspiration from the Internet.

8.2.1.4 Natalie's Use of ICT in Relation to Her Peers Outside of School

Natalie's week-long record sheet in which she marked all contact with digital technologies in detail showed an unambiguous tendency to spend her free time with digital technologies, primarily in relation to peers and to herself (see Fig. 8.1). In the same way, the period of time Natalie spent with digital technologies is worth noticing. The graph shows that on Saturday, she spent barely any time with digital technologies. During the interview, she explained that she was at a birthday party. By contrast, she did not have any other activities planned for Sunday, so she "made up" for the absence of contact with her mobile phone and spent the most time from the entire week with it.

Since Natalie's week-long record contained almost exclusively the "peers" and "herself" categories, we focused on the specific activities within these categories in more detail. As the following graph proves, the activities were not overly varied. The contact with peers concerned written online communication or online videocalls. The "herself" category contained primarily the passive browsing of social networks (Facebook, Instagram) and watching television series or films (see Fig. 8.2).

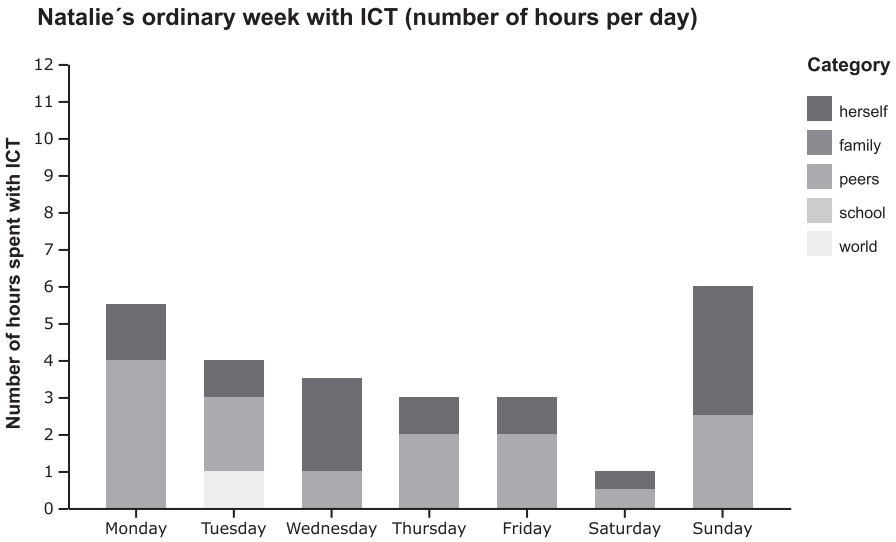

Fig. 8.1 Natalie's ordinary week with ICT according to the purpose of ICT use and the number of hours per day spent with ICT

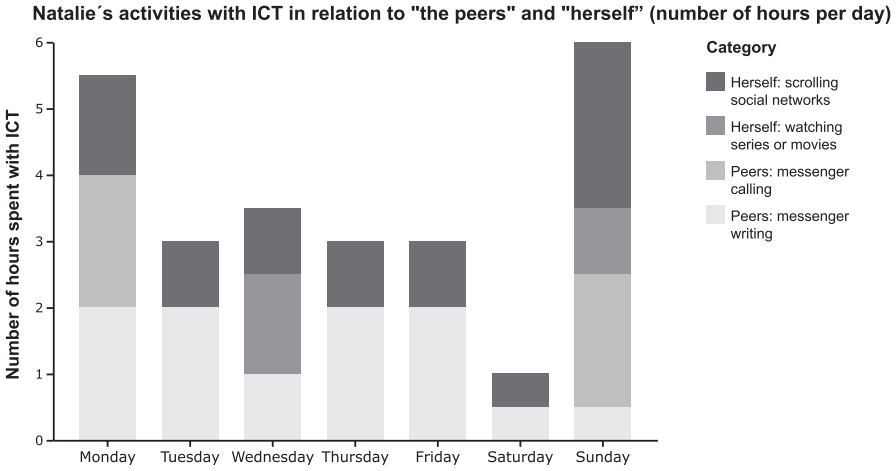

Fig. 8.2 Natalie's ordinary week with ICT in relation to her peers and herself and the number of hours per day

The figure shows that Natalie used social networks very often for communicating with peers. But it cannot be said that she only saw the positive aspects of this type of communication. Several times, Natalie recorded multi-hour videocalls with her friend in the week-long record sheet. In these calls, the girls first dealt with current matters and school-related tasks and other shared duties. Only then did they focus on discussions about their own interests, mutual friends, family, etc. Natalie

feared that if they were unable to call each other, their friendship would not last, because they did not feel the need to see each other often. In this regard, the digital technologies can be definitely viewed as a tool fulfilling Natalie's needs and goals and therefore as a good servant.

In terms of ICT as a good servant, Natalie demonstrated "informal collaborative learning," fully controlling and using the digital technologies for her purposes: "For example, once we recorded ourselves cooking something. That was fun." Natalie and her friend had to study a recipe and prepare the food in precisely the right amounts. The result was that they learned to cook a specific dish. In addition, they strengthened their cooperation competences and collaborative skills, as they had to agree on something to cook and to create the procedure for the activity itself. The development of digital literacy remains rather in the background here, since Natalie did not mention what digital technologies she used and in what way. The goal was important to her and her friend and she used adequate digital technologies to achieve it.

On the other hand, such activities were rather rare in Natalie's life. Much more frequently, she said that "parallel online living" took place, in which she and one of her friends or her brother were in the same place, but all simultaneously focused on activities on their own mobile phones: "Well, both of us were on our phones, we didn't pay attention to each other. We were on Instagram. Every time we find something, we show it to each other. I was also texting with another friend from class. You know, shared texts, such as how are you and so on." Natalie did not much like spending her free time in that way. She wished for people who intentionally came to one place to focus on each other and not on the activities on social networks or on communication with someone who was not there. She expressed a wish to spend less time with her mobile phone, but only if all of her peers did so as well.

> Not like that they would not be on the phones at all. But for example, when there are three of us together in a room, why be on the phone. My friend comes, and wherever she comes, the first thing she does is to log on to the Wi-Fi. And when I ask people why they are on the phones, the answer – what else am I supposed to do – is kind of ridiculous. And I can't just sit and look at them.

Natalie felt forced by her surroundings to use digital technologies in the same way in order to fit in. Natalie often thought about the fact that digital technologies can truly become a bad master for people in this regard. She feared that it made people lazy and indolent, because thanks to the Internet, they had everything within arm's reach with a minimum of effort and energy, even communication with other people. She considered digital technologies to be the reason present-day adolescents do not meet in person so much anymore, but tend to communicate online and have few experiences together, which can lead to estrangement. At the same time, she was afraid of gossip spreading quickly and easily via online communication, and people abusing others using fake accounts. Natalie also criticized people who write anonymous, unfair, and often offensive comments under YouTube videos or over the Tellonym application.

8.2.1.5 Natalie's Use of ICT in Relation to Herself

Natalie's time spent with digital technologies in relation to herself featured almost exclusively the use of her mobile phone, which she used to watch television series, movies, and short videos on YouTube. She looked for inspirations for Christmas gifts and for videos of her favorite actors and singers. When she played floorball competitively, she spent a lot of time watching tutorials for various floorball techniques, on the basis of which she tried to improve her playstyle on her own. When she quit floorball a couple of years before the interview because of an injury, she also stopped this type of learning. At the time of the interviews, she used the Internet as a source of information, because she read the news, which can be considered a form of informal learning, to develop her knowledge of current events, and she also learned to develop critical thinking.

For Natalie, the Internet was primarily a way to entertain herself when she had some free time, whether at home in her room or waiting for a bus, or possibly riding on public transportation. Specifically, she spent this time by scrolling and liking photos and stories on Instagram. In this regard, the mobile phone could be considered a good servant for Natalie, because it helped her overcome boredom or made the time pass more quickly while travelling. At the same time, even in this case there was a thin border, which if crossed could turn ICT into a bad master, leading Natalie to pay less attention to her surroundings and focus exclusively on overcoming her own boredom, which could lead to a lack of focus on other duties.

When Natalie was at home and all of her chores were done and she had more time for herself, she actively used Instagram for her self-presentation. On Instagram, she shared photographs of herself taken exclusively in front of a mirror in the bathroom and she made great efforts with them, putting on nice clothes and applying make-up. She was delighted by the amount of positive feedback her photographs accumulated. In this regard, ICT can be viewed as a tool for the targeted acquisition of positive feedback to her person and to her appearance, which improved Natalie's self-confidence and thus created her own identity.

8.2.2 Alice's Story

Alice lived in a small village near a regional capital together with her adoptive parents, who are also temporary foster parents. An eight-year-old girl also lived with the family at the time of the research. Alice has an older step-sister, who lived separately from the original family, with her husband and two children. Alice did not spend a lot of time with her parents. At the time of the data collection, she was attending the last year of a primary school and her grades were poor. She was not very popular among her classmates and she found barely any friends in school. For several years, she faced her classmates' unflattering comments about her appearance (she had an overbite). This was one of the reasons for Alice's frequent use of social networks, through which she made a good friend who lived in another part of

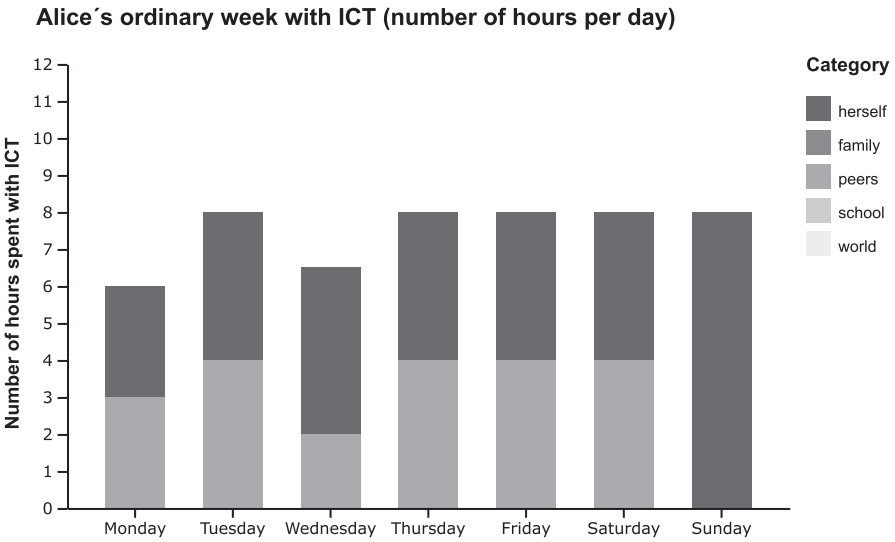

Fig. 8.3 Alice's ordinary week with ICT according to the purpose of ICT use and the number of hours spent with ICT

the Czech Republic, so they were not able to meet regularly. However, she communicated with her friend every day. Alice's record sheet showed that with small breaks, she spent entire days with digital technologies, including during school time. Alice referred to herself as being "addicted" to the mobile phone. She explained this by stating that she spent as much time with it as possible (see the Fig. 8.3). Interestingly, Alice only marked activities in the "for peers" and "for herself" categories. This supports the statement that for her, ICT are primarily tools for replacing offline relationships and for activities aimed at self-development.

8.2.2.1 Alice's Use of ICT in Relation to the Family

The use of digital technologies for family reasons, whether this concerned communication or intergenerational learning, was not reflected in large amounts of data for Alice. Her mother had a generally negative attitude toward digital technologies, though she used digital technologies when needed. Because of her mother's lack of interest, there was no intergenerational learning during which Alice could teach her mother other purposes that digital technologies could be used for or how to use them. By contrast, Alice considered her father to be very skilled in the use of digital technologies as well as knowledgeable in hardware. However, she did not use digital technologies with him for spending time together nor as a tool of intergenerational learning.

Nevertheless, Alice emphasized the advantage of social networks, because thanks to them she was able to stay in contact with her cousin who lived far away.

Alice rarely used digital technologies for the purposes of communication with her parents; if she did, it occurred primarily when she wanted to report that she would come home from school later than usual. For these purposes, she exclusively used regular text messages or calls. Strong parental regulations were already mentioned in Chap. 6. Parental regulations were the reason that Alice rarely used the computer and did not develop her competences in its use in that way. The parents had password-protection on the computer so that Alice would not spend too much time on it. Therefore, she was only able to use the computer if she convinced her parents that she needed to use it to do her homework. In terms of other digital technologies, she only used her mobile phone. For Alice, the question of mutual trust with her parents is interesting. The parents did not trust Alice to use digital technologies responsibly and so they introduced strong regulations. Alice even learned that her mother checked her communications on Messenger, as the following example shows:

> I left the phone alone in the room where my mother was and my mother… You know, when I wanted to gossip with someone about the teacher who was mean to me, well she wanted to take a photo once, so I took a photo and then I sent it to a friend and the friend – she looks like a potato. And then my mother started talking to me about it, why are you texting to Barča that the teacher looks like a potato, what if she learns about it? That's actually how I found that she was looking into my communication.

After this experience, Alice decided that she needed to maintain privacy from her parents and she wanted to have the option of her own autonomy and space where she could safely confide in her friends concerning the things she worried about and which her parents did not understand. However, since Alice participated neither in open conflicts and arguments nor in discussions with her parents, she decided to secure her mobile phone and the individual applications with a password so that her parents could not access them anymore. Simultaneously, she mentioned that her parents often judged her unfairly when they automatically expected that Alice spent time only on her mobile phone when she was out of their reach, even if it was often not so:

> For example, I'm drawing something or doing something other than texting and looking something up in the phone, going to draw something, going for a run outside and so. And then Dad tells me off and says that I've been on the phone the whole day, but it wasn't true, I was doing something completely different.

Despite the unfair judgement, Alice herself expressed a wish to spend less time with her mobile phone, because she believed her father, who often convinced her that ICT are primarily a bad master of people and that they have a negative effect upon their health.

> Yep. Because it's not really good, the amount of time I spend on the phone. It is bad for the eyes and it is not particularly good for the brain. It will dampen the cells in your brain, Daddy says. So I'd like to do some sports more, I would like to lose some weight, because I think I could get in shape a bit.

Therefore, Alice saw the mobile phone as an obstacle for the realization of offline free-time activities. At the time of the interview, her plans were only in the form of ideas, because the options the mobile phone offered represented much greater temptations for ways to spend her free time.

8.2.2.2 Alice's Use of ICT in Relation to Orientation in the World

To the question of the practical use of digital technologies, Alice surprisingly did not mention any practical uses similar to the uses of other adolescents in our sample (searching for public transportation connections or orientation using the maps in the mobile phone). Alice only listed regularly reading news on the mobile phone for better orientation in contemporary social and political events, since she monitored Czech media and the Facebook pages of some Czech and foreign political parties. She also focused on foreign news services, primarily the BBC. For these purposes, she used Twitter, where, in addition to the news, she followed tweets from her favorite bands and often actively responded to these tweets. In this regard, the ICT were a good servant for Alice.

However, Alice told us that she was aware of the dangers that social networks may represent, especially account theft. She independently stated that she was afraid of "having a Facebook account hacked" by another person or a virus. She was careful to use safe passwords and only add people she knew personally as Facebook friends.

8.2.2.3 Alice's Use of ICT in Relation to School Purposes Outside of School

Alice used digital technologies rather rarely for school purposes. When she did, she used the home computer with MS Office upon agreement with her parents. More often, she only needed to find some information for her homework or to verify the correct result of a homework assignment. Her own mobile phone served her well in this regard, because the computer was password-protected.

8.2.2.4 Alice's Use of ICT in Relation to Her Peers Outside of School

In the introduction to Alice's story, we mentioned that she had few school friends. For this reason, she used the mobile phone primarily to compensate for face-to-face contact and face-to-face friendship. In our interview, Alice's story constantly turned toward her "long-distance" friend, who she met online on the basis of a shared interest in the same kind of music. They quickly became friends who confided in one another and talked about their own problems in the offline world. Several times, Alice referred to her friend as the support she lacked from her peers and her family in the off-line world.

In additional to providing mutual support, the girls spent their free time together through ICT. In this free time, both of them had the opportunity for their own development or for joint informal learning. Because of the Internet, it did not matter that they lived far apart. Primarily, Alice mentioned joint music composition. First they wrote the words, then they composed the tune accompanied by a ukulele. Then they sang their compositions together, accompanied by the ukulele, and recorded them

on a mobile phone. No such collaborative learning occurred in Alice's offline world. Her life offline primarily involved "parallel online living." She regularly met at the bus stop with a classmate who took the same route to and from school and they rode the city public transportation together. They walked together, but each of them listened to music played on her own headphones. If some part of a song piqued one's interest, they would offer it to the other one to listen to.

Learning English was another good example of ICT being a good servant for Alice in connection to her peers. Alice repeated her dissatisfaction with the teaching of English in her school several times, but at the same time, she liked English and wanted to improve her level of English, so she often used Facebook to communicate with her peers abroad, which helped her to improve her level or English.

For Alice, the digital technologies were recorded as a bad master in only one regard, which was not repeated in the other adolescents. This concerned the perception of a mobile phone as a status marker among her peers. Alice stated that she had owned a push-button phone for a couple of years, then she had a touchscreen phone, but a completely basic one. Alice's mobile phones were lower status than her classmates' mobile phones. For some time, this was one of the reasons (apart from her appearance) her classmates mocked her. Our results suggest that mobile phone type can make a person a target of mockery in a certain environment.

8.2.2.5 Alice's Use of ICT in Relation to Herself

For Alice, the use of ICT for the feeling of personal freedom was the most visible. In the online world, she became a different person, a self-confident person with friends in the online world, a person who was not afraid to comment upon the statuses or tweets of both famous and ordinary people. In this regard, ICT can be considered an excellent servant for Alice. This was proven by the feelings of anxiety, sadness, and loneliness that arose when Alice's parents confiscated her mobile phone. In addition to missing the communication with her virtual friend in times when the phone was confiscated, Alice reported missing the ability to listen to music, which was an important form of relaxation and calming for her when she experienced stress or had a bad day. The following example proves that music also helped Alice to deal with a teacher who was unkind and unsupportive according to Alice:

> Every day, she would yell at me for something or just went and called my parents. She just had to yell at me in front of the entire class, so that everyone would make fun of me, and on top of that, she would be telling me that I couldn't get into art school, that I don't have any talent. She was mean to me and she was really bringing down my self-confidence. I really felt completely down because of her, but somehow, when I was listening to the F.O.B. [a band], that could improve my mood and everything was better. So I miss the music the most, because it can just somehow completely calm me down. And it makes me happier, makes me look at things better than I do when there's nothing but silence around me.

Further, in relation to herself, Alice used digital technologies for her own self-realization, self-presentation, and self-development. The examples included

creating "fan edits," which Alice described in this way: "A fan edit is in fact a cut video, in which you have, you know, your various favorite actors and bands, as a recording, a video cut from other videos. And you can have various effects in the video and even some music or something." At the same time, Alice pointed out that she was not very good at editing videos and that she did not have a sufficiently powerful mobile phone for this, so she tended to just comment under good fan edits on YouTube and draw inspiration from the work of others. Apart from listening to music, Alice herself liked to sing and she stated that she even improved her singing skills thanks to videos on YouTube:

> For example, I learned how to sing thanks to my favorite singer. He does not upload any singing lessons, but according to various videos from shows, I just started singing along with him and I have gradually improved my voice. So I can't sing solo, but I can sing with someone. As a second part.

Alice also spent a lot of time taking pictures of nature. She tried to learn how to take proper and good photographs on the mobile phone from YouTube videos and then she published her photographs on social networks.

The last field in which she was intentionally learning through digital technologies was English. She watched various interviews on YouTube, tried to practice her understanding of spoken English, and developed her vocabulary. She wrote down the words she did not know and translated them using Google Translate. In this way, Alice studied English every day. However, she struggled in English in school because the lessons primarily focused on grammar, which Alice did not find entertaining.

In her free time, Alice irregularly read works on Wattpad. She especially enjoyed fan fiction based on her favorite bands. Because of her goal of exercising more and getting into better shape, Alice tried to exercise regularly. She even used apps that promised weight loss and a fit body for exercising.

In addition to time intentionally spent with her mobile phone, Alice also used the phone to procrastinate. Here, the ICT was a bad master, because she knew she should have focused on preparations for school or on housework, but instead, she reached for the mobile phone and read new posts on Twitter, Facebook, and Tumblr. She also sent pictures of herself to her friends. She enjoyed playing with various filters.

8.2.3 Petra's Story

Petra lived with her parents in a house in a small village. She had an older brother who no longer lived with the family. At the time of data collection, Petra was attending the first year of a four-year gymnasium in a nearby city, to which she commuted by bus. In some subjects, Petra was used to using digital technologies both in school and for school preparation. The gymnasium was more difficult for Petra than primary school had been, and she spent most of her free time preparing for school. The

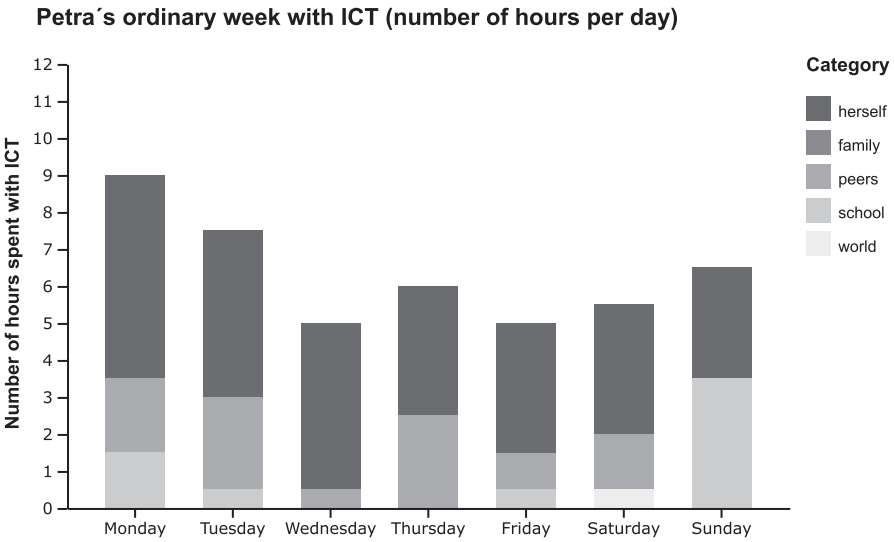

Fig. 8.4 Petra's ordinary week with ICT according to the purpose of ICT use and the number of hours spent with ICT

week-long record sheet shows that Petra used digital technologies immediately after waking up and for preparation for school, during which she listened to music. In that way, Petra used digital technologies continuously throughout the entire day. She stated that she had to limit the time spent with digital technologies because she did not have as much free time as she used to. The Fig. 8.4 created from her record sheet illustrates the use of digital technologies in Petra's ordinary week.

8.2.3.1 Petra's Use of ICT in Relation to the Family

Petra considered her parents technically skilled because both of them used computers in their work. She saw her father as more technically skilled, because he was the first in the family to start using WhatsApp. By contrast, her mother had just a push-button phone for a long time. Petra's mother had owned a smartphone for several years at the time of the interview, but she only used it for practical purposes, such as communicating with colleagues and friends or using an online calendar. Petra stated that there was no mutual learning to control digital technologies in the family, as everyone learned on their own. She listed a single example of intergenerational learning: using mobile phone navigation when the family travelled somewhere by car. She said that it would take her mother a long time and so she preferred to ask Petra for help. Petra considered her older brother to be the family expert on digital technologies. He did not live with the family anymore at the time of the interview, but he helped with choosing new mobile phones and with technical difficulties. Petra had one grandmother who actively used a smartphone primarily to organize

excursions with other seniors. She did not need any help with this. The whole family regularly used digital technologies to watch the "Game of Thrones" television series together, and, less frequently, to watch feature-length films on the weekend. Petra did not confirm any other joint use of digital technologies within the family. The parents did not have a completely positive attitude toward digital technologies and preferred to spend time without them. Petra's parents often reproached her for spending too much time with the mobile phone and thus having less time to study. At the time of data collection, Petra had failed to explain to her parents that when she uses her phone during study times, it was for the purpose of preparation for school. She often searched for information or verified facts on the phone.

8.2.3.2 Petra's Use of ICT in Relation to Orientation in the World

In terms of practical use, digital technologies were Petra's good servant, such as her mention of online clothes shopping. This may have been due to the limited availability of shops in the smaller city near where Petra lived. On the other hand, within the family digital technologies were considered a bad master that had to be used with care. Petra did not have a bank account of her own, but she selected her clothes on her own online and then her mother ordered them for her. Petra emphasized that she was instinctively careful both during the online shopping and in communication on social networks. She was aware of the dangers digital technologies could bring in this regard. The examples she listed were cyberbullying and account theft. She had not experienced any of these dangers herself.

Petra considered digital technologies a good servant for practical use for school. She ordered her lunches on her mobile phone, monitored changes in the school schedule, and tracked her grades in individual subjects.

8.2.3.3 Petra's Use of ICT in Relation to School Purposes Outside of School

In contrast to our previous respondents, Petra often worked on her homework on a laptop. The students often received homework in the form of a group project on which she worked with her classmates and she used Messenger for communication. They used Messenger to agree on the procedure of the work and to distribute tasks. However, for their group work on a presentation, there was no joint work shared in a cloud environment. The members of the group sent all the information to a single classmate who created the presentation alone. Petra mentioned that such homework assignments were not typical for all the subjects taught in school. This only occurred in geography class, which was taught by a young teacher who came to the school shortly after graduating from university and who was fond of digital technologies. The students even had Facebook group with this teacher, and he sent materials for

his lessons to his students and communicated with them there. On rare occasions, Petra also received Russian homework related to digital technologies; the homework mostly concerned completing online grammar exercises.

For school purposes, Petra had to monitor the Škola online (Online school) application every day; the teachers entered grades, attendance, and student evaluations into this app. This application had completely replaced the printed student record book, a replacement that was viewed positively by Petra:

> Well it's good, it's better, because I lost my record book so many times at the primary school and then I didn't have any grades there and I didn't know my grades in any subject and it's so good to have it in this app. It also calculates the average, so I know the current grade I'll get for the term. In addition, we have the school schedule there and they let us know there if we have some lessons switched, if we have a different teacher, if the lesson takes place in a different classroom and so on.

The teachers used this application for communication with both students and parents simultaneously. In this regard, the application completely replaced e-mail communication.

8.2.3.4 Petra's Use of ICT in Relation to Her Peers Outside of School

In communication with peers, Petra appreciated that they could be in constant touch because of social networks, but she also expressed sadness about this very online availability, which made her friends lazy and significantly limited physical contact. She mentioned that she would like to go out with her friends more often, but that many of them preferred online communication. She also considered it unpleasant (similarly to Natalie) when some of her friends constantly had the phone in their hand and kept communicating with others, even though they were outside together and they could have paid attention to each other.

Petra was the only one from our sample who regularly used a laptop in addition to a mobile phone; she used the laptop to connect to social networks, on which she communicated with her peers. According to Petra, most communications contained questions about schoolwork, but she also discussed personal things with her good friends via Messenger. However, Petra saw the constant availability and peer expectations about constant presence online as negative. The messages she received from her friends throughout the day often distracted her from her work. She often turned the wireless connection off or turned the mobile phone off completely for that reason. Her parents supported her in this course of action. Petra also stated that after she turned the mobile phone back on, she immediately received huge numbers of messages asking if she was okay and why she was not responding: "Then I turn the phone on and I get a million messages and calls if I'm alive, why is my phone not ringing and why am I not responding, simply what is going on." Here, Petra warned of the negative side of contemporary adolescents viewing constant availability on social networks as an absolute matter of fact.

8.2.3.5 Petra's Use of ICT in Relation to Herself

Petra did not use digital technologies in her free time within her hobbies or for informal learning very often. In her words, she would "use digital technologies to fill some empty time or use them to procrastinate" when she did not feel like doing her chores. To fill empty time, she listened to music; as with some of our other respondents, this typically occurred on her way to school or when she had to wait somewhere.

Petra listed playing games (The Sims) as an example of a procrastination activity. However, that occurred rarely for her, because she no longer allowed herself to postpone chores or homework and other duties very often. But she said that when she did not feel like studying, she procrastinated with her mobile phone. She scrolled through social networks – Facebook and Instagram – where she looked for new posts by her friends, although she herself was not active on these networks. If she wanted a longer break from studying, she watched a series on her laptop. These examples show the thin line between ICT as a good servant as a tool for resting and as a bad master supporting procrastination.

8.2.4 Matej's Story

Matej lived in a housing project apartment in a regional capital with his mother, father, and two sisters. The entire family were practicing Christians and went to church mass together every Sunday. At the time of the interviews, Matej was attending an eight-year gymnasium and had good grades. For his parents, it was important that the children were not overly stressed from school duties or by the amount of free-time leisure groups. That is one reason that the parents tried to spend free time together with the children playing board games and going on trips to the countryside. However, Matej often experienced boredom because of this parental tendency not to stress their children with many organized activities. It was in these moments of boredom that he reached for the mobile phone. The week-long record sheet shows that Matej was the only one from our sample who listened to classic radio after waking up and who did not spend time with his mobile phone before afternoon (see Fig. 8.5 for detailed description of Matej's week with ICT).

8.2.4.1 Matej's Use of ICT in Relation to the Family

For Matej, intergenerational learning in the field of digital technologies also occurred rather rarely. He stated in the interview that his parents used to help him create PowerPoint presentations when he started receiving them as homework assignments, but that they did not acquire the necessary knowledge and the fundamentals of presentation creation in school. Apart from this example, he reported no intergenerational learning, not even in the direction from Matej toward his

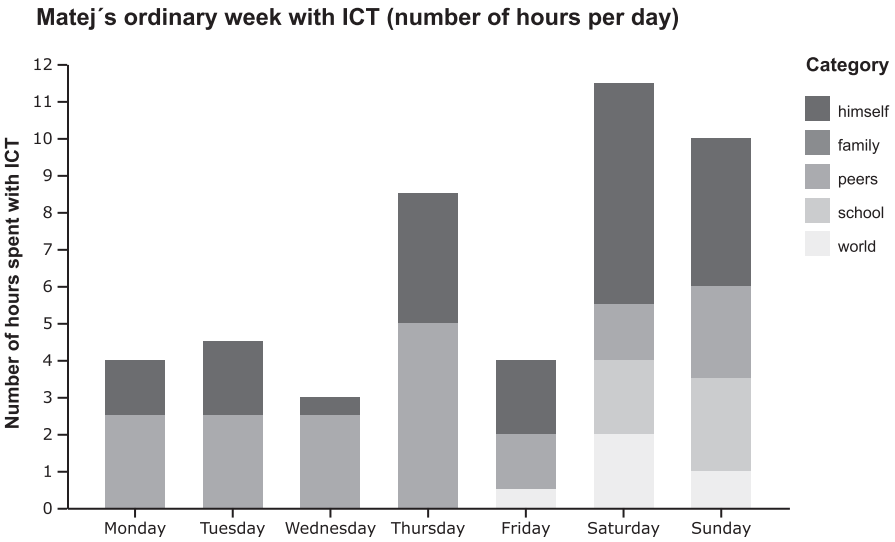

Fig. 8.5 Matej's ordinary week with ICT according to the purpose of ICT use and the number of hours spent with ICT

parents, even though he did not consider them to be very skilled in the use of digital technologies. He considered his father to be the less skilled parent; his father evaluated himself in the same way in the interview with the parents. This may be explained by his age. He was the oldest person in our sample; he had lived both his childhood and adolescence in Communist Czechoslovakia, so he had not had a lot of contact with digital technologies in his childhood or in his adolescence. His father's occupation did not require advanced use of ICT, even though it was a rather difficult occupation. Matej stated that there was no space for mutual learning even with his grandparents. He had one grandmother, who did not own a computer and who had a push button mobile phone, which she used without a problem and with which she did not need any help from the family. Even though Matej has two sisters, he did not exchange experiences connected to the use of digital technologies with them either.

Probably because of his family background, in which digital technologies played but a minor role, Matej had never (even as a child) desired to have a mobile phone as much as many of his peers did. He said that he got a mobile phone from his parents primarily so that he would be constantly within their reach and so that they could call him (and so he could call them) at any time. Matej did not consider this reason negative in any way. Joint time spent with digital technologies occurred only when watching television, which was almost exclusively news and sports broadcasts.

8.2.4.2 Matej's Use of ICT in Relation to Orientation in the World

For practical purposes, Matej used digital technologies primarily for watching news, for which he used his mobile phone as well as television; he also read the news. Matej himself emphasized that he was careful about getting information from "reliable sources." If he was not sure about the accuracy or truthfulness of some information, he verified it through multiple sources. As a matter of principle, he avoided tabloids and focused on more reader-demanding and journalistically better sources, even though he did not discuss this matter in school or with his family.

Matej also praised an app that monitored the current locations of the city public transportation vehicles. If there was a delayed connection, he was able to react immediately and change the planned route or delay leaving the house so as not to wait too long at the bus stop. In the field of transportation or travelling, Matej also uses maps in his mobile phone for orientation in the city rather frequently. However, he uses the map on his mobile phone the most often on his regular bike trips. "Mapy.cz is a good app, contrary to Google maps, they even have forest paths in the maps and so. Marked, I mean. Google maps are better used in the city. When I ride my bike, I tend to use forest paths rather than roads, so Mapy.cz is useful." At the same time, he stated that he searches for tracks he considers interesting in the maps at home in advance and that he plans every trip using a map in advance.

8.2.4.3 Matej's Use of ICT in Relation to School Purposes Outside of School

Matej did not use digital technologies for school purposes, for example for doing his homework on a PC, very often. He stated that on rare occasions, the students were asked to create a PowerPoint presentation on a given topic for some subjects. However, digital technologies played an important role in Matej's life in communicating with classmates for mutual help, primarily in mathematics. Matej mentioned that every two weeks, his mathematics teacher sent his class a total of thirty problems that the students were to calculate independently and that were then used in a graded test. For these purposes, Matej and his classmates had a group created on Messenger in which they worked together to calculate difficult problems and they tried to find the solutions together.

The last use of digital technologies for school purposes listed by Matej was the electronic attendance book and record book that had already replaced their printed ancestors completely. Matej verified the homework specifications, the planned school events, and the study materials from the teachers in the electronic attendance book or the record book. Matej appreciated the transition to an electronic format, even though his parents also had access to the electronic record book. In addition, he stated that unlike some of his classmates' parents, his own parents did not check the record book regularly and did not concern themselves with any bad grades he received, which happened rather rarely, so he was not stressed when he got a bad grade.

8.2.4.4 Matej's Use of ICT in Relation to His Peers Outside of School

In contrast to the stories presented so far, Matej did not use digital technologies primarily for "chatting" with his classmates. In this regard, he appreciated the digital technologies primarily because he could use social networks to arrange the logistics and organization of sports tournaments he participated in, because he played table hockey competitively. He travelled outside his home city with his team for league matches almost every week and the organization via social networks was crucial for him. "When we have some group matches coming up, we arrange who travels with whom, at what time we should meet and so on, because we don't see each other in person." In this regard, the mobile phone was unequivocally Matej's good servant, allowing coordination of the team without the need for face-to-face contact.

He much preferred spending time outside with his friends. Because of the digital technologies, it was easier to organize meetings. Matej observed that digital technologies greatly simplified the organization, because it was possible to quickly find out who was free and when and where they should meet. He remembered the times when they did not have mobile phones and it was harder to find free time together and arrange a meeting.

> It used to be like this, I told a friend that we would go on a trip in three days and he lives somewhere outside the city, so we have to meet, we have to meet at the agreed location and if I came down with something, for example, that could've been a big problem, and now it's completely okay, I text him and everything is arranged and we don't have to do anything the hard way and travel there and so on. And, especially, we can write each other to meet outside in ten minutes.

At the same time, Matej stated that digital technologies could cause laziness and estrangement among people. He mentioned that most of his peers preferred to spend time alone with their mobile phone and communicate over social networks rather than to go outside. However, Matej saw face-to-face meetings as better in terms of quality for maintaining long-term friendships.

8.2.4.5 Matej's Use of ICT in Relation to Himself

Social networks played an important role in Matej's life. But he was a rather passive user. He would "kill" time on social networks browsing through his friends' posts on Facebook and Instagram. But he did not post any statuses on Facebook himself, nor did he participate actively in discussions on social networks. He was only active if he managed to take a nice photo of good quality. This was what he shared on his profile. Even though it did not seem like Matej spent most of his day with digital technologies, he expressed the wish to do more activities without digital technologies. He considered spending time without purpose on social networks an unnecessary waste. However, as he said, he often did not have anything better to do. This can be related to what we noted at the beginning of this story, that Matej's parents emphasized not stressing their children too much with leisure groups and chores.

Browsing social networks was a regular ritual for Matej, as was shown in his record sheet. Every day, he prepared a snack after coming home from school, and at that time he regularly checked his friends' activity on social networks.

Apart from social networks, Matej used his mobile phone to play games. However, he did not play long-term strategic games; he preferred knowledge games. He would somewhat "forgive" himself for spending time with the mobile phone in this way. By playing knowledge games, in which he learned something, he would "lighten the load" on his conscience, which was frequently bad because of his monitoring of social networks. He also stated that he played games only when he was bored. This means that in his case, we cannot speak of a planned or targeted playing of games on the mobile phone. Matej chose games that he considered developmental, and used this tactic, on an imaginary scale, to add weight to the side on which the digital technologies are a good servant subjected to Matej's needs and decisions.

Matej was the only one in our sample who did not listen to music; he did not use the mobile phone for this purpose either. He used YouTube, but he searched for instructional videos to various sports tricks (tricks with a ball, card magic, etc.). At home, Matej also regularly exercised with videos published on YouTube.

8.2.5 Renata's Story

Renata lived in a small city near a regional capital in a rather wealthy family with her parents, an older sister and a younger brother. At the time of these interviews, she was attending the last year of a private primary school. Outside of her education, she went to several leisure groups and spent time with friends and family. Digital technologies were often used within the family time together. The week-long record sheet shows that Renata (with some exceptions) used digital technologies only in the afternoon after returning from school or from leisure groups (see Fig. 8.6).

8.2.5.1 Renata's Use of ICT in Relation to the Family

Renata's narrative indicated that because of her skills in the use of ICT, she was the family expert on digital technologies in some aspects, as the following excerpt from her interview shows:

> I am really well-versed in our car. I just can turn on, there's this screen, you know, and it controls the entire car, not even Mom can do that, so that's what they need me for. For example, how to turn on the lights in the car, air conditioning, or multimedia, what phone is connected to it. If we listen to some music, it has to be done from the front seat, but I mostly navigate them from the back seat and when I'm sitting in the front, I'm doing it.

This interview excerpt shows a certain feeling of indispensability, which her skills in the use of ICT provided to Renata in certain aspects within the family. If Renata was unsure about a specific way to use digital technologies (primarily the

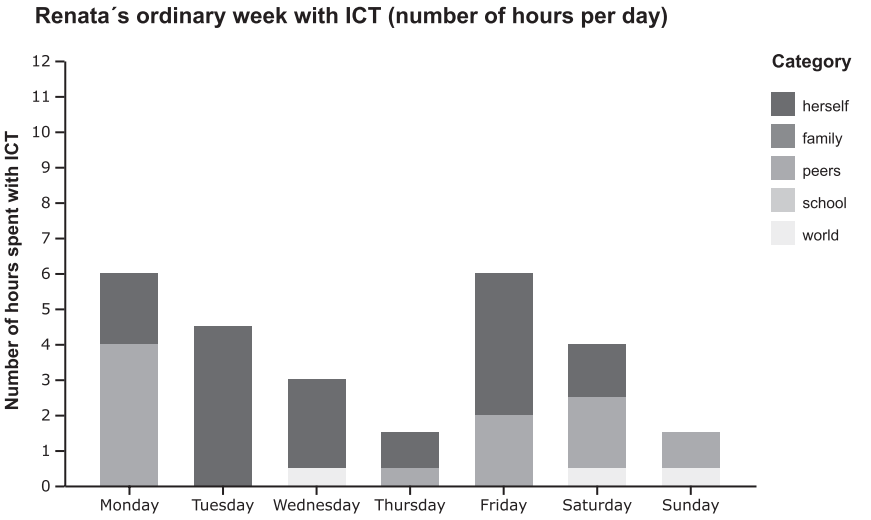

Fig. 8.6 Renata's ordinary week with ICT according to the purpose of ICT use and the number of hours spent with ICT

options of uses of social networks), she asked her older sister, who was a more experienced user of social networks than Renata. However, even for Renata's family, there was no significant intergenerational learning; as with the other respondents, it was more of a sporadic phenomenon.

However, the family spent time together watching politically focused programs that were broadcast only on the Internet (DVTV,[1] Stream[2]), which supported Renata's critical thinking about the contemporary political situation and about social events in the Czech Republic and abroad. Usually, the family would mirror videos on these topics from a tablet to a smart TV. The programs focused on content that did not get sufficient coverage by the traditional national Czech television media, or the programs were specific in some other ways. The family would also mirror from a tablet to the television to show family photos from trips to their grandmother and comment on them.

There were no hard regulations on Renata's mobile phone use. The mobile phone was not a tool of constant control for her parents. She stated that, in contrast to most of her peers, she did not have to use her mobile phone to report to her parents after returning from school or if she was delayed somewhere. Renata really appreciated this freedom: "A lot of my friends from school do that, they have to constantly report to their parents, and it just surprises me a lot, because their parents really do have to have control over everything. We don't do it that way and I really wouldn't

[1] DVTV is an audiovisual news and journalism project in the Czech Republic.

[2] Stream.cz is a company producing video content (programs and series) for the Televize Seznam television platform. In the past, it was a full-fledged server with its own content, which was complemented by downloaded TV shows and videos uploaded by users.

like it." Renata mentioned that there were some family rules, but as long as they were adhered to, she had freedom in the use of ICT. These rules include a "one digital technology at a time" rule, because the mother did not like it when the adolescents watched television and used a tablet or a mobile phone at the same time. The adolescents respected the "one digital technology at a time" rule.

8.2.5.2 Renata's Use of ICT in Relation to Orientation in the World

As regards the use of digital technologies for practical purposes, Renata mentioned barely anything. She confirmed that she did not have a lot of applications installed in her mobile phone or on her PC. The only practical purpose that can be mentioned is the regular monitoring of the weather forecast, according to which Renata regularly chose which clothes to wear. She used a mobile application, but when she was in a hurry, she asked Siri. She was the only one of our respondents who used an iPhone. In the question about Internet banking, Renata responded that she did not know what this was. She did not yet have an account of her own, and so she did not use Internet banking and she was not interested in this subject.

8.2.5.3 Renata's Use of ICT in Relation to School Purposes Outside of School

Renata used digital technologies for school purposes only rarely. Generally, she did not get any homework and she thus did not have to focus on preparation for school very much. To a large degree, this might have been due to the curriculum of the private school Renata attended. The school curricula was largely based on student autonomy and on group projects. Renata mentioned that she was not very good in the use of MS Office, because she did not have a reason to learn it. However, at the same time, she mentioned that they use MS Word in school.

8.2.5.4 Renata's Use of ICT in Relation to Her Peers Outside of School

Renata considered digital technologies a good servant in communication with peers. She was especially grateful for social networks. She considered these platforms where her peers could relax and where one could discuss personal questions better and more honestly than in person, where the communication could be affected by shyness or nervousness. Renata viewed social networks as a tool thanks to which one could get to know their peers better than in regular face-to-face contact.

According to Renata, the social network environment was more suitable for getting to know one another because of the omnipresent feeling of anonymity. As an example, she spoke of her classmate who did not talk very much with others in school and did not participate in anything, and who could be downright unpleasant. However, in communication with Renata over social networks, he manifested

somber (for example, he tried to reflect on the behavior of his classmates, even though in school it appeared as if he did not perceive or participate in any activities), and he felt like sharing his life story and his thoughts with her in great detail and with great intensity.

In addition to using digital technologies for communication, Renata used digital technologies in face-to-face meetings with her friends. For example, they used their phones for joint shooting of mini-movies:

> Me and my friends, we started shooting movies on a regular camera with a tripod during the holidays (laughter) about three years ago. And mostly it ended up very badly, because we had the wrong programs for recording and cutting, and stuff even got lost and so on. But we liked it, so we found ourselves, we wanted to do the cutting on our own, because the girls did it on their computer. And so we recorded something in the garden, speeded up jumping on the trampoline, or some silly things like that. And then we tried modifying the color and so on.

Even though Renata was not always satisfied with the end results of the joint movies, she always had a lot of fun with her friends and learned new things together, specifically editing and splicing videos. This is an example of collaborative learning (skills) between friends. In contrast to the other girls, Renata did not mention "parallel online living." She either communicated with her peers online from home, or, when she was with them in person, she neither communicated online with other people nor listened to music on her own. She spent time with the person with whom she was physically at the given moment.

8.2.5.5 Renata's Use of ICT in Relation to Herself

Renata's use of ICT for her own purposes was characterized by procrastination and informal learning. She mentioned that when she did not feel like doing chores or schoolwork or when she was supposed to work on some homework, she regularly reached for her mobile phone and watched videos on YouTube. Renata mentioned that in this regard, digital technologies were a bad master for adolescents. "Because, for example, I watch YouTube for a long time and I even watch meaningless stuff and I don't have to do that. And in school, it is one of the main topics, the distraction it represents for us. Well and even for myself, I have seen a lot of things proving it, so…I could study instead of this, because that would be good. But I just don't feel like it." In this regard, the attraction to digital technologies lies in the fact that they provide immediate entertainment with minimum effort. The example also proves that ICT gained control over Renata when she let herself be lured by videos she did not even want to watch, but she could not resist the offer.

Even though Renata did not use digital technologies for learning for school, she used them very often within her informal learning. For example, she regularly browsed Facebook or YouTube in search of recipes and guides how to bake something or prepare some dish. She then tried to cook along with these videos, either alone or with her sister. She searched the Internet for videos focused on cosmetics, make-up, and care for her appearance. She tried to use the advice and

recommendations from these videos to care for herself. In addition to these videos, Renata frequently used Pinterest, on which she searched for inspiration for creating decorative items for the household. She liked to paint and sought both inspirations for what to paint and new drawing techniques. It was important for Renata to have interests and to develop them, which was one of the reasons she mentioned the following: "I also have a file there containing only the items that captivate me. Painting and decorations, but I also have stuff about fashion there and so on, everything." This is creating and strengthening her identity as an artist, and the digital technologies help her in this regard.

The last item mentioned by Renata was the frequent use of the Sketchup and Fusion programs, in which she could again use her creativity, and she entertained herself by designing houses, rooms, and gardens. Renata considered her free-time activities with ICT to be entertainment, but simultaneously a pragmatic way to spend time with digital technologies, because she wanted to study at a secondary art school. Skills such as painting, designing, and spatial imagination would be important prerequisites for her acceptance and for other reasons. The activities she enjoyed could develop her in this direction.

8.2.6 Jiri's Story

Jiri lived in a regional capital in a single-family house in a wealthy family and he had a younger sister. At the time of the interviews, he was attending the fifth year of an eight-year gymnasium that was considered one of the best in the city. Jiri was thus occupied with preparation for school as well as free-time activities and he also had some temporary jobs. He had a good relationship with his parents; they spent time together in several ways, including actively using digital technologies. The week-long record sheet showed that Jiri used digital technologies every morning to listen to music while preparing to travel to school. Jiri did not use digital technologies while at school; he returned to them only after his arrival home (see Fig. 8.7).

Since Jiri's activities were more diverse than those of our other interviewees, and he was the only one from our sample to mark activities in all of the determined categories, we present them in more detail for the purposes of illustration in the Fig. 8.8 as well.

8.2.6.1 Jiri's Use of ICT in Relation to the Family

Jiri's father was well-versed in the use of digital technologies and Jiri considered him an advanced user. Jiri's father taught him how to use his first mobile phone. Jiri talked about his mother in diametrically different words. She had to use a computer at work and she learned to use MS Office and the programs necessary for her work. However, according to Jiri, it cannot be said that digital technologies were a hobby of hers or that she enjoyed their presence. This was also shown by Jiri's statement

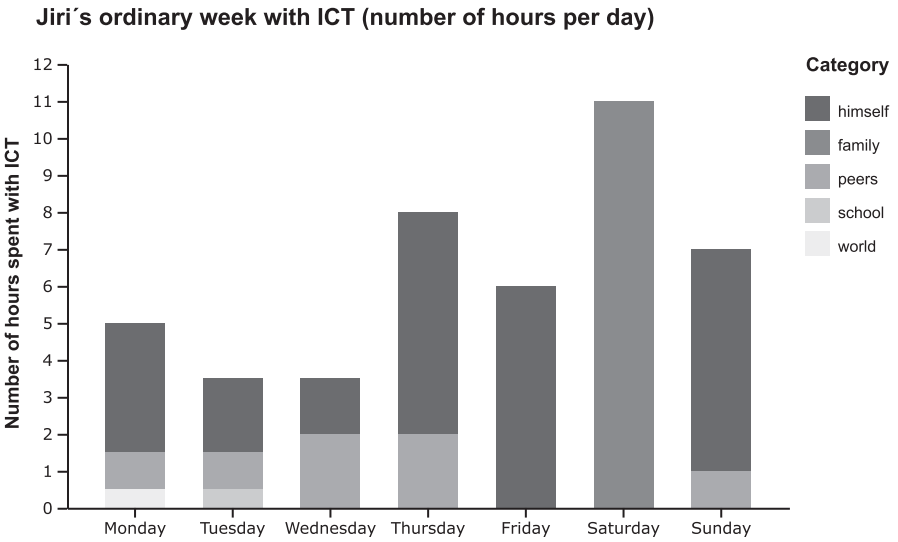

Fig. 8.7 Jiri's ordinary week with ICT according to the purpose of ICT use and the number of hours spent with ICT

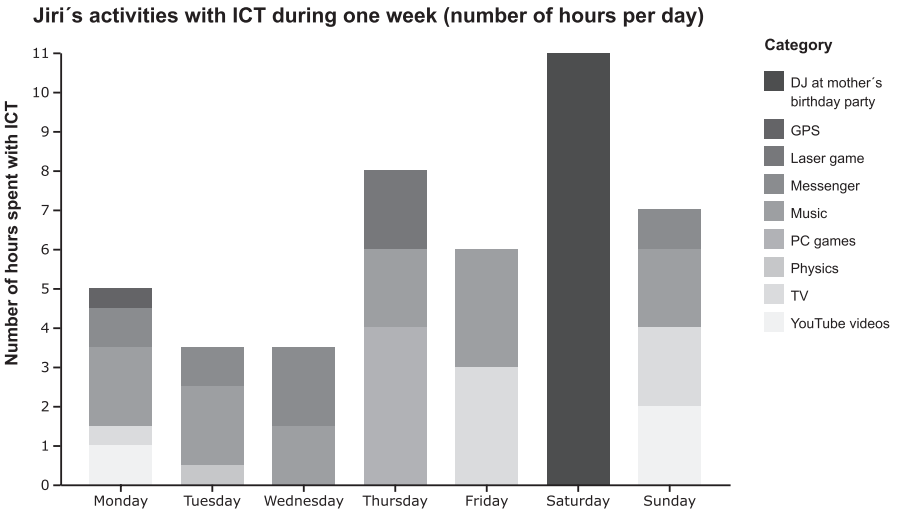

Fig. 8.8 Jiri's activities with ICT during one week

that she referred to all digital technologies as computers and that she did not have an idea about the prices of digital technologies. "For example, we recently discussed my purchasing a computer with better performance and she asked me for example, that she expected, that it would cost like 80 USD or so. There it was clearly visible that she kind of lacks the general knowledge about the field. That for example she knows how it works because she needs it for her work, but not like she's knowledgeable in the field." She did try to accommodate Jiri and she listened to his arguments about the importance of purchasing newer and more expensive digital technology. Jiri's mother also often comes to him for advice on the use of social networks. According to Jiri, "she only has them [social networks] for the sake of appearance, and when she decides to log in and use them, she mostly asks me for help even when she just wants to write to someone. She is not really well-versed in it."

Joint use of ICT for the purpose of spending family time together was rather passive – watching television. Jiri and his father also played some games together from time to time or they tried to create a short movie using a mobile phone app. Jiri mentioned his role as a DJ at his mother's birthday party, when she tasked him with the entire music section including background music.

Jiri also expressed his satisfaction regarding parental regulations. He did hear from his parents that he spent too much time with digital technologies, but he did not care about this very much because, as he said, "That's the typical parental speech, which is everywhere, or at least very often for boys, that you are on it all the time." Jiri himself raised the question of gender in the approach to digital technologies. He says that girls did not spend as much time with digital technologies playing games as boys commonly do. And so, according to Jiri, neither his parents nor his sister understood that it was not possible to immediately quit every game and for example go to dinner:

> The game mostly cannot be paused, that's what the parents still don't understand (laughter) so they just call you downstairs or call you to come to see them, but you really can't leave at that moment and you should finish it. Well you can tell your friends that you will have to leave soon, but I need to finish this, so perhaps I can talk the parents into it. Sometimes they can be persuaded, mostly it needs an agreement – then I'll do it another time. But it is not really frequent that I tell them "just a moment."

At the same time, Jiri confirmed that he was not being regulated very strongly by his parents and therefore he had a lot of freedom in ICT use if he fulfilled his home and school duties. With Jiri, strong parental regulations and (strict) limitations of time spent with digital technologies were not an issue. On the contrary, Jiri reflected a rather successful domestication of digital technologies within the family. This showed ICT being used as a good servant; digital technologies helped strengthen the relationship between Jiri and his father in their joint activities.

8.2.6.2 Jiri's Use of ICT in Relation to Orientation in the World

In terms of practical uses, Jiri, like Matej, primarily used the application monitoring the current condition of public transportation and he searched for bus departure times on his mobile phone. He used it primarily on his way to school. The bus Jiri

rode was often delayed. If the application showed that the delay was significant, it was worth it for Jiri to walk at least part of the way and not to waste time waiting at the bus stop. Digital technologies were a good servant for Jiri in this regard. Jiri was careful in his use of ICT and frequently thought about security when visiting websites. In his words, he was trying to avoid viruses and similar threats that could infect his computer or mobile phone. On social networks, he participated in conversations with people he did not know personally with a similar degree of caution. He had experienced phishing; Jiri's friend's account was copied and someone had tried to cheat him out of some money:

> It was this girl from school and we only texted each other for a short time. And then she wanted to add me as a friend again. And it was kind of weird, but I thought, well, something could have happened and she could have deleted her account. So I added her and she said hi, so I said hi. Then it went typically, how are you and then it moved to if I could send her something. And I just went –hey, not really, I can't. And then it was weird for a moment, so I checked the Facebook and found out that there were two accounts. One with diacritical marks,[3] and the second one without them. I hadn't noticed it at all and so I immediately wrote her, the girl, I mean, that someone created a fake account and it was deleted in like two minutes, completely gone, and the conversation was deleted as well.

Jiri was the only person from our sample to mention that he had his own bank account and tried to manage his pocket money. He also earned money from temporary jobs. Therefore, he was the only person from our sample to use Internet banking and online shopping without parental surveillance. His father taught him to use Internet banking; he viewed it as part of financial literacy. This again proves the successful domestication of digital technologies within the family and the effort to use them as a good servant.

Jiri was very careful so that none of his social accounts nor his bank account could be hacked. He improved his chance of resisting possible attacks by regularly changing his passwords and by using a different password for each account, even though he had to evolve into this decision.

> Yeah, when I was younger, I used to have the same password everywhere, but I recently started changing it up. And once I needed a friend to do something for me in one game, there was a task which you have to complete continuously and you get these huge rewards. And I was on vacation and didn't want to look like an addict, so I asked him to do it for me. And I know that I used to give him my password, I trusted him completely, and I was giving him the password from the game and the one from email.

At the time of the interview, Jiri had become much more careful and also cautious in accepting information available on the Internet and coming from various sources. He was very critical of people who did not verify information and trusted the first alarming news appearing on the Internet.

> Should I really talk about our presidential elections (laughter)? Well if I do that, the matter was, for example, that it was really built on that campaign, but the second thing is that a lot

[3] Breves and acutes are diacritical marks used in the Czech language: ˇ Breve, for example Č, ě (softening); ´ acute, for example Á, é (lengthening); ° ring, ů (originally "uo").

> of people I saw in the Internet polls, for example they did not vote for Drahoš,[4] because he expressed positive opinions on the questions of migrants. But it really was not that straightforward. And that's exactly the thing about verifying one's information, which we discussed at the beginning, it is important in this case. Because there is a problem on one hand that certain information spreads only because people are stupid and then there is the other thing that people are indolent, lazy, they don't feel like verifying the information at the moment and they believe the first thing they see written.

Jiri was actively trying to develop his critical thinking, verifying information, and collecting pro and con arguments on the basis of which he then decided his position on the matter. He was aware of the thin line between using ICT as a good servant and ICT becoming a bad master. Jiri also noted that digital technologies could be a bad master by diverting people's attention from their immediate surroundings. He did not use a mobile phone or listen to music when walking around the city in order to stay focused on the traffic.

8.2.6.3 Jiri's Use of ICT in Relation to School Purposes Outside of School

Like the other adolescents from our sample, Jiri confirmed that digital technologies were often not necessary for school preparation. From time to time, they were asked to prepare a presentation or to write an essay on the computer for homework. However, Jiri used the Internet very often while studying and preparing school, because he searched for information on history, such as complementary resources and articles about the discussed topic, from his own initiative to learn more.

In the course of school preparations, ICT were a good servant for Jiri, especially social networks, which allowed him to get notes from school lessons if he was absent from school or if he forgot his notebook at school. When he contacted his classmates, they quickly took some photos and sent some of their own notes, which were as functional for Jiri as his own would be.

He was the only one of our respondents to mention the advantage of ICT in cheating on tests. For physics, he used the computer to print out formulas in a small font and he used them directly in the course of the test. As the following excerpt from his interview shows, this was not Jiri's habit, but rather an extraordinary situation in which he wanted to make sure that he got a good grade.

> So I know, that it was a week ago, we had a test, not a week, two months ago, we had a test from physics and the test was practically easy and it was focused on formulas. Well actually. We did some momentum and work. And there were some of the more complicated formulas and I had a lot of other tests to study for on the same day. So I fired up Word, put the font size to, some, four and wrote a crib sheet for myself. That happened for the first time in my life, I think. And it was a bit weird, because when you write a crib sheet, it should be handwritten.

Jiri also stated that he printed more of these crib sheets and that his classmates were very eager for them. This is an example of the use of ICT as a good servant, as

[4] One of the presidential candidates in the 2018 elections.

it helped Jiri and his classmates achieve success in school testing. However, we can also say that it was a bad master, because it enabled cheating. On the other hand, the cheating took place in the context of multiple tests in a single day, and so even a good student like Jiri was forced to resort to this unauthorized aid.

8.2.6.4 Jiri's Use of ICT in Relation to His Peers Outside of School

In contrast to the expressed fears, in Jiri's case, positives predominated in the evaluation of digital technologies. He considered them a good helper in daily life and especially in contact with his peers and especially in situations when he was bored. Thanks to social networks, he did not have to be alone with his boredom and there was always someone with whom he could spend time, at least online, even though he preferred personal contact. However, this did not occur very often because of his work and his friends' schedules, as can be seen in the following quote:

> Well, there's not enough time and you can do it via Messenger at any time. In the evening, you write with each other, you take a shower, you go to bed and write with each other. And you cannot really sacrifice fifteen minutes by travelling, going somewhere in the evening, then talk for like half an hour and then travel fifteen minutes back. You know, this is a half an hour of travelling for half an hour of talking, which simply is not worth it, when you have a school week, during which you study a lot.

For Jiri, the relationship of his peers to ICT was characterized primarily by joint playing of games; he and a couple of his school friends would agree on a specific time and play together. In these games, the players also had a video connection or used chat and agreed on game tactics, discussed the game's progress, and made observations. This supported Jiri in developing networking skills and collaborative skills, so ICT was a good servant in this regard.

In Jiri's circle of friends, it was popular to tag others for fun on social networks. Jiri considered this very entertaining and also a way to get to know each other better and to work more on shared laughs and experiences. The following interview excerpt gives an example of this:

> For example – tag someone who should bake you a cake. And you tag someone who can't cook at all. So, I tag people as a joke, cause I know that we will pause over it and have fun, or that we have an experience we shared together and this reminds us of it, that's what we have, so it's fun to tag them and they will remember and we will have a laugh. And we also had this period, when me and my friend, we were making fun of each other, so we were tagging each other almost everywhere. So you would turn on Facebook and you would have thirty notifications. That was funny.

Jiri was aware of the dangers posed by fake accounts and unverified information, but he also cared that the tagging game was fun for everyone participating in it. He was aware of the dangers and negative consequences of cyberbullying, even though he had never experienced it himself.

8.2.7 Jiri's Use of ICT in Relation to Himself

In ICT use for one's own purposes, two tendencies to use digital technologies were identified in the interviews with Jiri. On one hand, there was spending free time without purpose and procrastinating; on the other hand, there was spending free time deliberately with digital technologies. These two tendencies can be perceived as examples of the metaphor of ICT as a bad master and a good servant in the everydayness of adolescents.

In the first case, Jiri listened to music and browsed social networks or videos on YouTube while waiting for a bus or his next out-of-school activity (leisure group, part-time job, dinner, etc.) or while he was on the bus. Time passed faster for him that way; he did not like to wait: "There are these waits, when you ride somewhere by car, then you wait somewhere, for example in a waiting room, and you know that you don't want to stare at the walls, so you turn on your phone and like do something on it for five minutes. The trick is to make the time run faster when you're waiting for something." However, Jiri also found himself in situations in which he was not waiting for anything, when there was a clear plan, such as to study for school, but he did not feel like it and he let himself be lured away by social networks or by playing his favorite game on the computer:

> Then there is the other thing, when you really don't feel like doing the work, so you just jump to Facebook and browse… Complete procrastination. So that's an everyday thing. If you want a number, it may be an hour, or hour and a half, I can't say for sure. It can be anything from one to three hours a day.

Jiri stated that actually all of his free time spent with digital technologies was the consequence of his tendencies to procrastinate, because he always had something to do, whether it was homework or housework: "For example, I realize and remember all the homework we have for school, because in school, they are kind of pushing it on to you, the teachers remind you…and then I will plan to play a game anyway." All the same, he mentioned that the time intentionally spent with ICT often concerned "more productive and more developmental activities." Among these activities, Jiri mentioned exercising, during which he uses applications for running and body building in his mobile phone. Even though these applications allowed sharing of performances with friends, which could lead to various sports challenges, Jiri used them exclusively for his own purposes and for a summary of his physical activity. He also used the mobile phone as a reader, since he was not overly fond of printed books, but he did read on his mobile phone. However, he probably spent the most time playing an online game, which he described in the following way:

> Well, it is a card game, but it is actually not a card game at all. Those cards have certain effects. And the effect can for example be, that, we are getting kind of deep into it, but… You summon an avatar with a certain number of lives and a certain attack. And then you combine it with other cards, so that it is not just a card game. It is a strategy of some sort and it is actually set in a card game, that's what I would say.

His parents approved of this game; they believed it had potential to develop Jiri's strategic thinking. Generally, Jiri avoided games with violent subtexts; he tended to

look for knowledge games, quizzes, and similar games. Jiri liked to do the activities with digital technologies that gave him at least some feeling that it was not just wasted time, but that the activities also contributed something positive to his own development or learning.

8.3 What Do Adolescents' Stories and Their Lives with ICT Tell Us?

The insight into the lives of six Czech adolescents has shown us a wide palette of ways that digital technologies are used. Of the available ICT, primarily the mobile phone represented a necessary and self-evident part of the everyday lives of the adolescents. For some of them, it was a tool for self-realization and the creation of identity during their adolescence; for others, it was primarily a tool for relieving boredom, or, on the contrary, a learning aid; for still others, it was an environment in which they found understanding and support of their peers. The entire chapter was accompanied more or less explicitly by the metaphor comparing digital technologies to either a good servant or a bad master. The investigation uncovered five important categories within which the adolescents used digital technologies (use of ICT *in relation to the family*, *to orientation in the world*, *to school purposes*, *to peers*, and *to oneself).* In each of these categories, digital technologies could be identified as both a good servant and a bad master. Here, we use the metaphor to answer the research questions asked in the introduction to this chapter. At the same time, we note the most important findings of the investigation confirming the used metaphor. A summary of our findings is listed in the Table 8.1 presenting all identified examples of the use of digital technologies within the metaphor regarding ICT as a good servant but a bad master.

With the first question, we tried to find *what digital technologies were being used in the daily lives of adolescents.* The investigation revealed that adolescents from our sample used the mobile phone almost exclusively from the entire spectrum of the available digital technologies. The reason they used just the mobile phone can be found primarily in the fact that in comparison to other digital technologies, the mobile phone was exclusively in their ownership and they did not have to share it with anyone, unlike a personal computer that may have been owned by parents or shared by the entire family. The adolescents had their mobile phones permanently within reach and it was a completely common part of daily life for them. It accompanied the adolescents with small breaks from the moment they woke up to the moment they went to sleep. The adolescents themselves viewed the mobile phone unequivocally as a good servant and an aide serving primarily their needs. With some exaggeration, it can be said that this single small device (often not very powerful) served the adolescents very well and thus "facilitated" their lives.

In the second question, we asked *in what way digital technologies were being used in the daily life of adolescents.* A more detailed insight into the data uncovered

Table 8.1 Summary of findings: ICT as a good servant and bad master in adolescents' lives

ICT as a good servant in relation to…		**ICT as a bad master in relation to…**	
…the family:			
Identified categories	**Specific examples or notes**	**Identified categories**	**Specific examples or notes**
Intergenerational learning (work with ICT)	Learning (from) siblings'/parents' ICT usage	*Conflicts with parents regarding the perception of ICT*	Parental belief that adolescents spend too much time with the mobile phone (see more in Chap. 6)
	Teaching grandparents to use ICT		
Communication with extended family	Keeping in touch with cousins	*Constant reach thanks to ICT*	Adolescents are constantly within the reach of parents thanks to ICT: Positive for parents, unwanted by adolescents
Joint activities with parents and ICT	Watching movies, viewing photos	*Undesirable parental regulations*	Time limitation of the use of ICT (see more in Chap. 6)
	Playing games		
	Shooting movies		Content restrictions on the use of ICT (see more in Chap. 6)
… orientation in the world:			
Identified categories	**Specific examples or notes**	**Identified categories**	**Specific examples or notes**
Practical functioning in the world	Public transportation: time schedule	*Possibility of hacked accounts*	Awareness from parents and school
	Maps	*Danger of spam*	
	Money management		
	Online shopping		
	Critical evaluation of information		
Autonomy	Acquiring digital skills	*Restrictions*	No Internet banking
	Ability to use them practically		Parental control of adolescents' communications
… school purposes outside of school:			
Identified categories	**Specific examples or notes**	**Identified categories**	**Specific examples or notes**
Easily accessible sources	Internet	*Getting information too easily (laziness)*	Internet instead of books

Easy sharing of notes	Social networks	*Possibility to cheat*	Copying from the Internet
Easy to get help from peers			
Group work			
MS Office	Self-acquired knowledge		
… peers outside of school:			
Identified categories	**Specific examples or notes**	**Identified categories**	**Specific examples or notes**
Substitution of face-to-face contact	Constantly available contact with peers	*Limited face-to-face contact*	Social networks and apps
Easier to get friends	Through hobbies (groups on social networks)	*Easier spread of gossip*	
Constant support of friends	Deeper relationships	*Danger of anonymity on social networks*	
	No boundaries		
"Collaborative learning"	Making, editing videos and music	*Danger of cyberbullying*	
"Parallel online living"	Parallel surfing, checking social networks	*Mobile phone as a social status*	Bullying because of an old mobile phone
…oneself:			
Identified categories	**Specific examples or notes**	**Identified categories**	**Specific examples or notes**
Personal freedom (no matter the place)	Internet: immediate availability of music, friends, family, information, etc.	*Personal lack of freedom*	Internet: loss of privacy
			Mobile phone: constant availability
Targeted free time with ICT	Games	*Procrastination with ICT*	Games
	Reading		Reading
	Music		Music
Filling empty time	Informal learning		Social networks
Self-presentation and self-realization	Social media		
	YouTube videos		

some ways that the mobile phone was used outside of school by "our" adolescents, including activities proving a certain loss of control over this use. In this regard, the use of mobile phone by adolescents outside of school thus shows characteristics of a bad master. This occurred primarily in one of the detected categories, which we refer to as *family* in this text. The adolescents' parents understandably had a key influence upon the lives of the adolescents. The parents primarily tended to incline toward the strategy we could describe, with some exaggeration, as: "Just to be sure, one can expect nothing but the worst from digital technologies and that is the attitude one must have toward them." The adolescents were being raised to believe that digital technologies are primarily a bad master fully in control of the adolescents, but that it is often "masked" as a good servant. However, in many aspects, the parental approach and their upbringing had a positive influence on the behavior of the adolescents, who were cautious about using the digital technologies. They were especially aware of the possible negative impacts of ICT abuse, and especially so about their prolonged use. However, because of this, they sometimes found themselves in unpleasant states and situations, in which they reproached themselves for spending too much time with the mobile phone and they kept searching through the remaining categories identified by us for "the right" degree of use of digital technologies that would satisfy both them and their parents. They often failed to find such a level, because it is a highly subjective characteristic. The question therefore is whether such a solution, satisfying all participants, can even be found. In our research, it appeared to be very difficult or even impossible. One explanation can be found in the fact that the context for digital technology use perceived as suitable by the adolescents often diametrically differed from the viewpoint of the parents. The adolescents "hid" in their rooms with their mobile phones to prevent their parents from seeing them and thus to prevent avoidable conflicts.

If we focus on the specific activities reported by our respondents with ICT, the most significant feature permeating all of the presented stories emerges: the sometimes almost compulsive need of the adolescents to spend time on social networks, primarily in online conversations with their peers. It can be said that each of the respondents viewed social networks as a good servant, because it replaced or duplicated face-to-face contacts and relationships. However, they revealed the thin line where the perceived good servant becomes a bad master, where they let the social networks control them and spent time using them instead of fulfilling their duties from school or home. However, the adolescents' need for online contact with their peers was often too attractive to resist. In other words, (conscious) procrastination on social networks was present in all of our respondents and it seemed to be an important motivation in ICT use apart from intentional online communication with peers.

The Fig. 8.9 gives a better idea of the activities for which our respondents use ICT. In connection to the adolescents' efforts to spend less time with ICT, the graph also provides a more specific idea of the degree of use of ICT by the adolescents. The adolescents themselves filled out the record sheets, so although they were instructed to fill out the sheets in detail, there may be some distortion between the time stated and the truly spent with ICT.

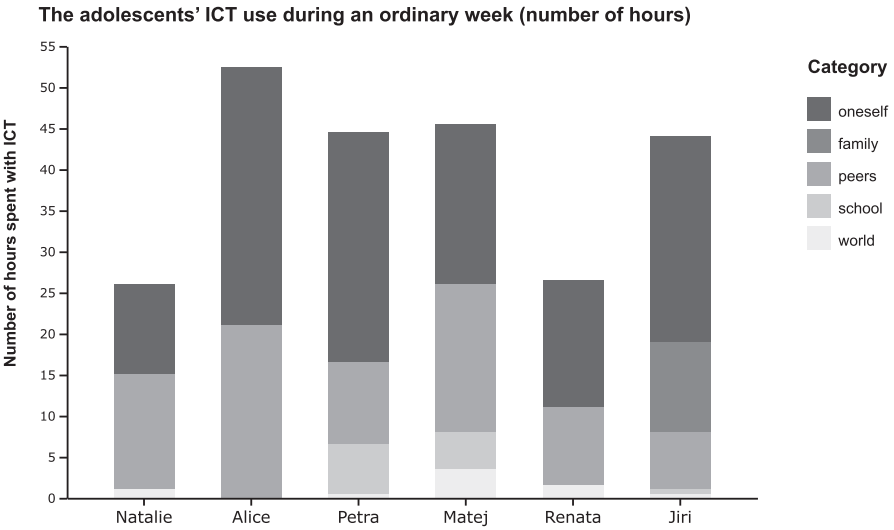

Fig. 8.9 The adolescents' (from our sample) number of hours spent on the five defined categories within one week

As the graph shows, the adolescents from our sample spent from 26 to 51 hours a week with ICT. Everyone spent the most time with ICT in the *for peers* and *for oneself* categories. With regard to the relationship to peers, this concerns primarily the online communication over social networks, specifically written communication via Messenger the most often, but communicating with peers online via videocalls or by sharing photographs were also frequent. The data also contained joint activities for which our respondents used digital technologies (joint shooting videos, composing music, etc.). The *for oneself* category then constituted primarily watching television series or videos, in which the adolescents used ICT primarily as a tool for rest and relaxation. Listening to music or passively browsing posts on social networks were also registered often. The use of ICT in the other monitored categories (*to school*, *to the world*, *to the family*) in the regular days of our adolescents represented more of a peripheral and infrequent activity. Our respondents registered such use rarely or never. This was true even though they spoke of those categories as ones in which digital technologies played a significant role as a good servant (for example orientation in the city, online shopping, searching for information on the Internet in the course of school preparation, etc.). The adolescents tended not to use ICT for school needs, which confirms the findings from Chap. 3.

On the basis of our data, adolescents chose such ICT activities that alone could be considered using digital technologies as a good servant (useful for their development, for strengthening relationships with peers, etc.). However, a problem arises when we focus on the suitability of the timing of these activities or on the context in which the adolescents performed such activities within their everyday life. If the adolescents truly had free time, meaning they did not have any other duties, then

ICT was a good servant. However, when the adolescents used ICT for their free-time activities at times when they should have been focusing on their duties (or in contexts designed for purposes other than primarily the use of ICT), whether toward family or toward school, the digital technologies often became a bad master. This applies because they distracted the adolescents from their duties and from their intended focus. In response to their irresistible allures, such as notifications from social networks or the idea of taking a turn in a favorite game, the adolescents were very often compelled to neglect their sense of duty for the easy and comfortable time spent with a mobile phone in the comfort of their room.

In the third research question, we asked *how adolescents used digital technologies in their learning.* In the answer to this question, the metaphor of a good servant and a bad master can be used as well. If we first look at digital technologies in learning as a good servant it is necessary to emphasize the most significant element of our research: informal learning. Adopting new skills or knowledge within one's hobbies were typical examples of ICT and learning in our sample, whether it concerned painting, photography, music, foreign languages, or sports. We consider the following finding interesting: In the course of preparation for school, digital technologies could be considered a good servant, serving the purposes of the adolescents, practically only in cases in which the adolescents themselves wanted to verify information acquired in school or to expand this knowledge with detailed information from the Internet. Of course, searching on the Internet itself for the purposes of learning can simultaneously be considered both a good servant and a bad master in the adolescents' lives. The Internet is definitely a good servant in terms of information being immediately available. Therefore, adolescents do not have to (for example) visit libraries. This immediate availability of information also has a negative side. The adolescents often referred to themselves as indolent, they rarely worked with books and they relied completely on the Internet. On the Internet, the adolescents were often swamped with large amounts of information from various sources and they were forced to consider their credibility. If they spent time considering the available sources and their credibility, then ICT was a good servant helping them to develop critical thinking, However, if they became only passive recipients and consumers of the most easily available information, ICT can be considered quite a bad master, because the adolescents were under the influence of unconfirmed information of dubious quality.

ICT can be viewed in a similar manner when the adolescents were supposed to create a PowerPoint presentation for teacher-assigned homework. The adolescents were forced to know and use PowerPoint presentations, even though they were never taught this skill in school. They had to learn these skills on their own at home, but they mostly lacked motivation, because they did not see any larger practical benefit or usefulness in the creation of presentations. As a result, the creation of presentations often created conflicts with the parents in situations in which the adolescents were forced to use the family computer to a larger degree during their work on school assignments. In this regard, ICT could be viewed as a bad master causing disagreements in the family on the basis of the lack of knowledge of the use of PowerPoint presentations and the pressure of the school for their use. At the same

time, this could be considered a certain paradox, because it could be expected for the adolescents to learn the basics of using computers in school in order to be able to fulfil the assignments at home without the need for assistance or interaction with their parents. Overall, as regards the question of digital technology-supported learning, the adolescents were learning to use digital technologies on their own, almost randomly, without more significant support from the family, peers, or teachers.

Teaching within families was the last category to surface in the topic of adolescent learning; the topic of intergenerational learning presented interesting results. It was revealed (as in the Chap. 6) that for the adolescents whose parents built their position on authority, there was no intergenerational learning whatsoever, because the parents would have seen the lecturing from their children as an attack on their authority. By contrast, in the families in which the adolescents had a larger degree of freedom and space for autonomy and the parents were not so attached to the obedience of their children and they did not see their parenthood from a perspective of enforced authority, intergenerational learning occurs naturally. In these families, the parents had their children regularly advise them in the use and function of digital technologies and the adolescents were often in the position of a family expert. The research showed that in the families in which the adolescents had more freedom, ICT was used more often for practical purposes such as online shopping, applications for orientation in the city, and news. This very use of ICT presumably developed the adolescents in both financial and digital literacy, in independence, and also in critical thinking.

8.4 Conclusion

In this chapter, we tried to gain insight into the daily lives of some Czech adolescents. In our research, we were not able to capture the development or transformation of adolescents in the long-term horizon, but some characteristic features of this developmental period appeared nevertheless.

One of these features was the relationship with the parents, which the adolescents from our sample perceived and experienced differently, and they were affected by digital technologies in necessarily varying ways. We described the parental views of digital technologies in their lives or in the lives of the entire families in Chap. 6. In this chapter, we add the perspectives of the children, from which we cannot completely exclude the family context. Even though we were interested primarily in digital technologies and we used a different methodology in our deliberations, the results of the research by Nosál (2002, 2004) that mapped the concept of childhood in socialism and post-socialism cannot be disregarded. Some of our results indicated a meeting between socialist or early post-socialist parental experiences and purely post-socialist childhoods in which digital technologies play an important role. And, in compliance with Macek and his colleagues (Macek et al., 2013), it should be noted that digital technologies have brought greater diversity to adolescent lifestyles and to their openness to new influences, which is reflected in

our sample by the range of activities and interests of the adolescents. This may be one of the main reasons for the varying views of children and parents on digital technologies in general and on digital technologies in learning.

Adolescents do not spend as much time with their parents as the previous "generation" of adolescents did (Macek et al., 2013). Nevertheless, the parents still have a significant influence upon the life of their children, even in the families in our research. However, in our sample, we saw various examples of everydayness in the families, and the digital technology was not necessarily the sole cause of the family spending less time together. Preparation for school and out-of-school leisure groups and hobbies may be rather time-consuming for some adolescents as well.

The need for privacy and a certain autonomy within the family is one of the important aspects of adolescence. The need to be in contact with one's peers is natural. Digital technologies play an important role in this, because they expand the options of communication among adolescents. This changes the perception of "being at home" (see the bedroom culture described in Chap. 6; Livingstone & Sefton-Green, 2016) and "being with peers." Geographical borders lose their importance in the online world, and the horizon of "being with peers" expands significantly as do the life experiences of young people. Thanks to digital technologies, adolescents are able to be in contact with peers from other countries and their experiences thereby acquire international and intercultural dimensions. In our sample, we found few examples of contact with peers from other countries, but it is important that this option exists and that it is natural for adolescents. This reflects a significant difference between the experiences of the adolescents in our sample and their parents, who have no such experiences from their own childhood and adolescence. This can apply both because when they were young, digital (online) technologies were not so widespread and because they grew up under late socialism, when communication beyond the national borders of the socialist bloc was not possible. Therefore, the use of digital technologies truly was one of the determining activities for the organization of the spacetime of our respondents to a significant degree (Thompson, 2004).

In our sample, it was revealed rather predictably that the opinions, friendship, and support of peers were important for the adolescents and that social networks represented a very suitable communication platform on which they spent rather a lot of time. The adolescents from our sample considered online communication to be a facilitation of communication across large distances, but also often an easier way to communicate and deal with sensitive topics than face-to-face communication. At the same time, some of them said that they would prefer to meet in person more. They explained that this did not occur because that their friends were not interested in meeting in person, so some of the adolescents in our sample were "forced" to spend more time online than they would have liked. They were afraid to be excluded from the peer culture and thus lose the contacts that were so important for them. The "exclusion" seems to be worse than being online against one's will for a longer period of time. Therefore, we reached findings similar to those of Pasquier (2008). In our research, the expression of one's self was also very important and it occurred in various ways in our respondents. Some used comments on YouTube, others would

regularly post selfies on Instagram or create videos. All of this goes hand-in-hand with the formation of one's self, and it is once again easier for some adolescents to express themselves online rather than in the offline world.

In Chap. 7, we showed that young people are starting to use digital technologies at early age, which may affect the perception of one's competence and autonomy in the use of digital technologies. Digital technologies are now undoubtedly an integral part of adolescent lives. Here, it is important to realize two important points. Our respondents were born between 2002 and 2003; when some of them started school, around 2009, neither mobile technologies nor social networks on the Internet were widespread in the Czech Republic. This may explain why their first phone, if they had one, was a push-button phone (with very limited functions), and why some of our respondents did not even feel a need to own such a phone. The second point is that if we view digital technologies in terms of everydayness, they represent an important tool, but not the only tool the adolescents use and that co-creates their everydayness. Digital technologies were a part of many different activities and contexts of the daily life of the adolescents we interviewed, with roles of various importance attributed to them, but they were nowhere near to being a part of all their activities. The importance of digital technologies in the lives of these young people should not be overestimated. Digital technologies are not a passion or a hobby of all young people, as was shown in our sample. Therefore, we cannot expect adolescents to automatically be "experts" on digital technologies, whether speaking of purely technical fields or of the use of digital technologies in various fields of life. This is in part due to their age, but it is also important to take into consideration their limited experiences with ICT in school (see Chap. 3) and in the home as well. Of course, this does not mean that they lacked the knowledge of many different applications or that they could not be advanced users. The adolescents' assessments tended to be based on their previous knowledge, skills, and abilities, which varied and which were acquired in many ways.

The mobile phone, which everyone in our research had domesticated and integrated into their daily routine, making it a part of their values, is unequivocally an integral part of the life of present-day adolescents. Its domestication was clearly and visibly successful. However, as we showed in Chap. 6, the mobile phone was not perceived as a non-problematical element of the everydayness. The 2012 study by Courtois and his colleagues emphasized the role of context. A mobile phone can be understood as a contextually anchored element participating in social relationships, and both its importance and use varies according to the current context. Using our metaphor, a mobile phone can be both a good servant and a bad master, both in the same and in different social situations and contexts.

The use of a program for creating presentations (in our research, this was exclusively MS PowerPoint) as mentioned by our adolescents, was yet another example of domestication. It was used quite frequently by the teachers in school and sometimes also by students in their homework. Full domestication did not take place for our respondents, because they used the program rather randomly without previous acquaintance with basic knowledge and user skills for this program either in school or at home. It therefore did not become a useful tool. With some exaggeration, it was

"forcibly" domesticated by teachers into our respondents' learning without clear connections to the (out-of-school) everydayness of the adolescents.

This brings us to the topic of digital technologies in our respondents' learning in more detail. In Chap. 3, we mapped the problems of ICT in the life of schools and in the work (teaching) of Czech teachers. We discovered that schools were equipped with digital technologies and that the infrastructure kept improving, especially in mobile phones and wireless connection. ICT were nothing new for the teachers, but the teacher-centered approach still predominated in education as did the use of digital technologies within the transmissive teaching style. In schools, the students experienced a very limited use of digital technologies by teachers. For example, in the interviews, we registered few mentions of ICT being used in project-based learning. Online services or social networks were used rarely and the use of mobile technologies was limited.

For example, the adolescents themselves did not evaluate their skills and knowledge in the use of ICT (digital literacy) as particularly advanced; they explained this by stating that they did not use the digital technologies necessary for learning in school very often and they did not know how to use them. However, they did reveal that they were capable of using some applications for learning outside of school and for resolving situations in daily life.

If we look at our research through the lens of the research by Furlong and Davies (2012), the adolescents in our sample used primarily YouTube, Pinterest, Google, and Duolingo as *resources for learning*. They used the Internet to develop their hobbies and interests (music, painting, exercising, taking photographs). In the category of *ways of learning*, we discovered primarily playing games (strategic, knowledge) and making of videos, but also informal learning using video, which filled the role of a teacher or an example of dealing with a given topic. We also discovered learning to use various tools, or how to control digital technologies, which was motivated by individual interest, which was close to fiddling with various settings and options. The adolescents also used the trial and error method. For the final category (*skills to support learning*), our sample showed primarily collaborative skills, when the adolescents made videos or composed music with friends.

Intergenerational learning in the field of digital technologies can also be classified in the group of informal learning, in which the adolescents could assume the new role of experts who "teach" the other members of the household. In this way, they acquired new skills, and not only in the field of digital technologies, but also those related to how to teach something to someone. That way, they moved into the role of "teacher," an experience completely different from the one they experienced in school. In our sample, we identified such learning, which for example contributed to a good relationship between granddaughter and grandmother (Natalie's story). In other examples, the grandparents were "self-sufficient," because they only used digital technologies in a limited way and their devices were "rather simple" (Matej's story). On the other hand, it was more typical in our research to find limited or no intergenerational learning in the field of digital technologies (especially children-parents). Therefore, in some cases, intergenerational learning cannot diminish the

risk of generational conflict (Patrício & Osório, 2016), and may even lead to explicit rejection.

Understandably, the ways in which the adolescents use digital technologies in school and outside of school varied (Erstad, 2012). Nevertheless, the school should not represent a "container" (Leander et al., 2010) separated from the life outside of it. Therefore, if we look on the use of ICT by adolescents in and outside of Czech schools, it is difficult to find common elements which would interconnect the life with ICT in and outside of school. We tend to think about two different worlds of learning and maybe even different lives with digital technologies that only exist side by side and intersect only rarely. In other times, they collide with each other like two balls and once again increase their mutual distance. The everyday practice of adolescents with digital technologies in and outside of school predominantly represent two discontinuous environments. We can use the mobile phone as an example: It is successfully domesticated in the out-of-school environment, while in the school environment, the domestication is being de facto intentionally prevented (by limitations or prohibitions of the use of mobile phones in lessons). Therefore, it is practically impossible for the mutual transfer of knowledge and skills in the use of this device between the different environments to take place, regardless of formal or informal learning or entertainment. The individual personal life experience with digital technologies thus contains gaps which are very hard to bridge.

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Conclusion

We find ourselves at the end of our book, in which we focused on the everyday lives of today's digital teens. Our primary goal was to describe and explain how digital technologies affect the everyday life and learning of present-day young people in various contexts and environments. We believe that our research, the main results of which are presented in this book, brought interesting and important findings, and also contributed uniquely to the expansion of the knowledge on the life of young people in the contemporaneous era of digital technologies, because it focused on the specific context of a post-socialist country in Central Europe, in the Czech Republic.

In our research, we tried to approach the problems of digital technologies in the everyday lives and learning of young people holistically, if possible, and we tried not to focus merely on the partial aspects of narrowly delimited fields of this extensive topic. On the basis of our findings, we considered it necessary to focus primarily on three basic contexts that seemed significant for adolescent life: the school context, the family context, and the context of their everyday lives. We structured this book in consideration of these three contexts; we gradually focus on each context in the following paragraphs. However, we will neither systematically summarize all the results of our research, nor we will re-introduce them in their entirety, as we have already done so in detail in the individual chapters. In this final part of the book, we emphasize only the most important findings and observations arising from our research while simultaneously considering some new challenges and questions raised in by our research.

The context of school was the first of the three basic contexts we focused on in the book, because school represents an absolutely fundamental part of the adolescents' everydayness. In connection with school, we were interested primarily in the manner in which digital technologies affected the life of schools and the work of teachers, but also in the manner in which the teenagers themselves live with digital technologies in school and how they use them to study in school. Our results showed that digital technologies have become an integral part of Czech schools; teachers

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use them in their work and students therefore encounter them commonly in the course of lessons. Computer labs, which are primarily used for lessons of informatics in many cases, are typical in Czech schools. On one hand, this represents a certain support of the development of digital literacy, particularly ICT competencies, for students; at the same time, it may represent a barrier for the use of digital technologies in different subjects, because these specialized classrooms are only available to the teachers of the other subjects on a very limited basis. The infrastructure in the field of mobile technologies is improving gradually, which could bring new options for the more intensive use of digital technologies even outside of computer labs. However, this field still represents rather significant challenges for many schools. The challenges are in technical matters, such as the sufficient speed and quality of the Internet connection, and in personnel matters regarding the management of digital technologies in school, as well in as the options and rules for (safe) student access to the wireless Internet connection.

The opinions of Czech teachers on the use of digital technologies in lessons are an important issue that plays a fundamental role in the context of schools. In our research, we used data from the ICILS research that suggested that Czech teachers were rather critical toward ICT and tended to primarily focus on the potential negatives connected with the use of digital technologies. Czech teachers were rather skeptical of the possible benefit of digital technologies in some aspects of student learning, such as student communication or collaboration. This skeptical attitude can be at least partially explained by the fact that the didactic use of digital technologies does not yet have a fixed place in the professional training of (future) teachers in the Czech Republic. Limited professional training and the subsequent skeptical attitudes might be the main factors leading to the use of digital technologies by Czech teachers only as an aid in the transmissive style of teaching. More advanced digital technologies designed for dealing with issues, for team cooperation and for creative work, are used only on a very limited scale. The rather significant representation of interactive boards in Czech schools can encourage the predominance of the teacher-centered approach. The interactive boards can be used very well in the support of transmissive teaching. The teachers may then be poorly motivated to search for other ways to use other types of digital technologies available in schools. Of course, we do not want to say that the traditionally oriented education supported by the interactive boards is always bad. On the other hand, it frequently leads to a focus on digital technologies typical for the school environment and therefore barely usable by the students themselves outside of school.

In the introduction to this book, we stated that the lack of relevant empirical data on the use of ICT in education in the Czech Republic was one of the reasons for our analysis of the data from large international studies. In the course of our research, it was confirmed that the interconnection of quantitative and qualitative data can be very beneficial, even in consideration of the limits of secondary analysis. For example, our secondary analysis of data from the PISA 2018 research showed that the use of digital technologies directly in lessons did not lead Czech students to use them on a larger scale outside of school environment. We believe that the aspect of management of activities based on the use of digital technologies may play a fundamental

role. In school, teaching activities are strictly delimited, managed, and controlled by the teacher – the use of the interactive boards is an example of this. By contrast, in the home environment, children and adolescents are more able to manage the learning and the ways of using digital technologies. In addition, they have different digital technologies available at home. This allows them to experiment and investigate various ways to use them, which is very difficult to do while using an interactive board, especially in teacher-controlled lessons in which the emphasis on the transfer of information predominates. The results suggesting that teachers clearly do not give the students homework that would effectively utilize digital technologies and subsequently naturally lead to learning and the development of digital literacy are not surprising either.

At this point, an objection can be raised that activities with digital technologies in school and out of school may or even must have a different character and the teacher plays an important role in formal education. We are of course in agreement with this. Nevertheless, the larger degree of student freedom in the use of ICT in dealing with tasks directly in lessons and outside of them, the larger emphasis on learning by doing or discovering, and the use of digital technologies that students know and use outside of school could become "bridges" to twenty-first century education. This concept of education would contribute not only to the development of digital literacy, but also to the bilateral transfer of knowledge and skills between the school and the out-of-school environment.

For teachers and their use of digital technologies, we can further assume that their concept of teaching often reflects the way in which attention is paid to the problems of digital technologies within the school policy in the Czech Republic and in the course of fulfilling the set strategic goals of the education policy. That is, the policy manifests features of a "symbolic policy" whose intention is primarily to declare interest in a topic and thus acquire political points. However, fulfilling the visions and goals of the school policy is no longer among the priorities. The principals and teachers then (rather understandably) bring this symbolic policy to life by making only minor changes with no actual impact on the quality or principles of teaching or learning with the support of digital technologies. It is much more difficult to change the thinking of principals and teachers and their approaches to teaching than it is to equip schools with state-of-the-art digital technologies. This can still be considered one of the largest challenges for the future, both for school policy and for the educators of future teachers.

Life in school includes the lessons in the classrooms themselves, but also the student life outside of it, which studies focusing on digital technologies in school environments sometimes fail to capture. The results of our secondary analyses of the PISA 2018 research showed that the general use of technologies in school, including the use of digital technologies during school breaks or for communication with classmates, is significantly connected to the use of digital technologies outside of school. Thus it seems that various forms of use of digital technologies in school outside of the lessons themselves can be an important bridge connecting the use of digital technologies in school and in the out-of-school environment. However, tendencies to reduce or completely forbid the use of digital technologies during school

breaks and thus limit these student activities are appearing in Czech schools. Our findings can be rather fundamental in this regard, because they warn of the importance of this topic. At the same time, they suggest that communication with peers and informal learning with or about digital technologies outside of lessons can be an important part of the overall learning experience in school. Its importance may even be significantly larger than one would expect.

This is supported by other findings of ours showing that the more digital technologies are a topic of discussion among adolescents, and the more they use digital technologies in mutual interactions, the more digital technologies are used for entertainment, but also for school-related purposes. Digital technologies are thus becoming a natural part of the communication, life, and thus also learning of adolescents. However, we have to keep in mind that we are speaking of the degree of use here, not about the quality or the manner of use of digital technologies in teenagers' lives. The results of our analyses also suggest that for the use of digital technologies in home environment for school-related activities, it is more important if the students have good conditions (which include ICT, of course) for studying and preparation for school than the availability of a wide spectrum of various digital technologies. The aforementioned findings thus raise new questions opening further research options. In particular, they raise questions about the problems of informal learning within formal education and about what communication and processes of (informal) learning in the field of digital technologies take place in school outside of lessons and how the transfer of knowledge and skills between the school and out-of-school environments occurs. The conditions for learning are also very important, which moves our view from the context of school to the context of family.

Of course, parents and the family environment are of absolutely fundamental importance in the life of adolescents, which was the reason that the family represents the second key context in our research. In the context of family and home, we tried to identify the factors that affect the inclusion of digital technologies into the daily life of Czech families, how parents view digital technologies in the life and learning of their children, and how digital technologies actually affect everyday family routines. At the same time, the fact that many parents grew up in the Czech Republic in times in which digital technologies were virtually inaccessible, or only gradually started to enter the life of post-socialist society and appeared rather sporadically in schools, was found to be a rather significant factor in our research. In this statement, we refer especially to the last two decades of the twentieth century. Parents (and many teachers as well) thus lack experience with the use of digital technologies in their own learning. Digital technologies were often not even a part of their growing up, which apparently affected their attitudes toward digital technologies. As with teenagers, it is important to monitor the life with digital technologies and the contexts with which digital technologies have been encountered for parents. Empirical research of the "learning lives" of parents, especially in post-socialist countries, would be very interesting. It would contribute to better knowledge of adult learning in the course of their lives, in various life situations, and provide a better understanding of their attitudes toward digital technologies, not only in the lives of their children.

This very different life experience with digital technologies may be one reason that parents (at least in our sample) preferred their children to spend their free time and to prepare for school without digital technologies. Some parents even confiscated their children's mobile phones or turned off the wireless Internet during the times when the children were supposed to prepare for school. Also, in our research, the parents considered digital technologies to be primarily tools for wasting time and entertainment for adolescents. They responded with suspicion if the adolescents used their mobile phones for their hobbies, for informal learning, or for reading. We registered very few parents' notes on the possible benefits and advantages of the use of digital technologies in learning for their children. Nevertheless, the parents in our research were generally aware that competencies in the field of digital technologies were important for the future of their children. The parents did see a certain benefit to the use of digital technologies by their children in the practical uses of digital technologies in specific (especially out-of-school) situations, such as in searching for public transportation connections or getting in touch when they were away from home. The parents also praised the electronic record books, or, more generally speaking, online systems designed for communication between the school and the family. Thanks to these tools, they were able to communicate with the school rather easily, and they were aware of the school activities and their children's results in particular.

These parental attitudes may reflect their own lack of opportunities to acquaint themselves with the options that digital technologies provide in education; there is a lot of information on the negative impacts available in the Czech media. The topic of family support in the field of the use of digital technologies has been discussed on the national level only for a couple of years and (probably) only the future will show if the political visions will be reflected in the real lives of Czech families.

The problems of trust between the parents and children in the use of digital technologies is another fundamental topic of our research. Our sample revealed that the lack of parental trust toward children was the motivation for regulations. The parents primarily wanted to control the use of ICT by their children, implementing regulations on use of digital technologies by their children, with the proclaimed intention of preventing the negative impacts of the digital technologies. The parents did not particularly trust the adolescents to be able to suitably self-regulate their own use of digital technologies without parental overview or intervention. Almost all of the parents in our sample referred primarily to the time their children spent with digital technologies as problematic. However, this raises the question of how much this topic is affected by the lack of parental trust toward digital technologies themselves or by their attitude toward the digital technology and to what degree it in fact represents a sensible use of digital technologies by children. In the interviews with children, we recorded situations in which the children considered the regulations on the part of parents unjustified and situations in which the children themselves were realizing that they were not always sufficiently able to regulate the time they spent with digital technologies. We believe that this is an important moment that deserves attention in other studies.

The everyday lives of digital teens, which of course necessarily permeate the previous two contexts as well, represents the third key context of our research. Looking into the daily life of present-day adolescents through case studies and our focus groups shows the dominant position of a single specific technological tool: the mobile phone, specifically the smart phone. It played an absolutely fundamental role for our digital teens and it was an integral part of their lives. The technical parameters of the device or its brand were not the only important factors by far. The mobile phone is a good example of how digital technologies co-shape the everydayness of young people. For some, the mobile phone was a tool for self-realization and identity creation; for others, it was primarily a tool for staving off boredom; for others, it represented entrance into the online environment where they found the understanding and support of peers that they failed to find in the offline environment.

The mobile phone can also help with learning, of course. We have already mentioned the limited use of digital technologies in formal education. It is interesting to look into the out-of-school activities interconnected with informal learning. We discovered in our research that both the mobile phone and various network activities have become a part of hobbies, such as art and sports. In accordance with our expectations, games (either knowledge games or strategic games) were also an important topic. Even though such uses are more or less intuitive, digital teens also cooperate with friends over networks while playing games and in various joint activities, such as creating videos together. The trial-and-error method, in which the teenagers try various options of programs or applications, can be considered almost a classic in the field of digital technologies. We presented some selected cases, but there are other procedures or forms of informal learning in the everydayness. Perhaps it is here that teachers and others could seek inspiration for innovating the school education, in which digital technologies would have a meaningful purpose. In this case, we are considering the use of teaching methods or tools of digital technologies that the students know and are able to use, albeit non-systematically and unconsciously. In education, it would then be possible to build on these "informal" experiences, knowledge, and competencies and to systematically develop them in such way as to allow the students to intentionally use them in various life situations.

However, digital technology use has various dark sides. Some teenagers in our sample were very well aware that the mobile phone could be a tool that distracted them from their duties, or that it could be a source of technical and social nuisance; some adolescents even realized the risks related to constantly "being" online.

The mobile phone is perceived very differently in different environments or contexts. As we have already suggested, it tends to be a rather unwelcome companion or helper of the teenagers in school and also at home. Its use in learning directly in lessons depends on the individual teachers and it mostly concerns episodic or one-time activities. We considered the parental attitudes – the phone was viewed rather negatively or at least with some reservations even in families. In the teenagers' free time, the mobile phone then becomes both a good servant and a bad master, since the boundary between the two options is very unclear and highly dependent on the context of use and the given social situation. The teenagers themselves sometimes did not know how to assess and resolve various situations. Sometimes they did not

even know where to look for support or advice. Such situations occurred both in school and at home.

The week-long record sheets document the varying use of digital technologies in the lives of our respondents. Activities with digital technologies were virtually disappearing from their life in school and they were being limited or forbidden at home. By contrast, their free time was very often connected to the mobile phone and related activities, and, with a certain degree of exaggeration on our part, even with the feeling of freedom. We believe that the week-long record sheets not only document the everydayness of our digital teens, but in our research, they served as the functional part of the research or data collection. They helped us to kickstart the second interviews, in which the respondents went into greater depth in the descriptions or explanations of their activities and simultaneously lost the natural shyness that sometimes accompanies research interviews. This contributed to the quality of the acquired data.

In several places in our book, we note that present-day teenagers have a rather close relationship with digital technologies, because they are growing up with them and they are sometimes the best in their family in using them. This sometimes puts them into the role of family experts on digital technologies. It was noted in our research that some of our respondents were not only the experts on the use of traditional technologies in the household, but even for the digital technologies in the family car. Our sample indicated that mutual learning or intergenerational learning in the field of digital technologies were far from automatically present in almost all the families. Mutual learning between parents and children took place only in some cases; in others, virtually no space was made for it. In this case, the "setting" of the family environment, the parents' priorities in life and upbringing, and their relationship to or expectations from digital technologies were the decisive factors. The type of digital technologies and the adolescents' degree of skill in their use also seemed to play a role here. These points are where the attitudes or expectations of both parties may clash, which may be the cause for no learning whatsoever taking place. The parents may expect some practical use of digital technologies, while their children prefer communicating over social networks or playing games. The teenagers might not always be able to explain the functions of some digital technologies to parents, because the teenagers' competencies are still on a basic user level and they do not know the principles or wider contexts or functions of a given service or device. We can assume that mutual discussion and clarification of needs and expectations from digital technologies from both parties could contribute to clarifying the varying views and perhaps even help develop joint interests related to digital technologies. Intergenerational learning represents an interesting idea in our research, albeit just a partial one. We observed that a joint interest in digital technologies and learning of (in our research) a grandmother and granddaughter can truly lead to a growing closeness. From our viewpoint, it is interesting to observe why mutual learning does not take place. In some cases, it is simply because the grandparents are using digital technologies only for communication (they own "only" a simple push-button mobile phone) and they are neither interested in digital technologies nor do they need them.

However, the relationships with grandchildren do not necessarily have to be impaired by this.

It is clear that digital technologies have become an integral part of the lives of present-day teenagers, even to such a degree that they largely shape the spatial and temporal organization of life and form their social reality. This does not mean that it is only the digital technologies that determine or form the lives of young people. In other words: teenagers do not live solely with digital technologies. Even though we refer to them as digital teenagers, in their daily lives, there are still many activities that take place completely naturally without digital technologies, and many moments in which activities with digital technologies permeate activities without digital technologies and vice versa. In the same way, there are significant differences among individual teenagers in terms of the degree and manner of use of digital technologies that must be taken into consideration in any future research. For example, taking the everydayness or the concept of learning lives as the starting point for research necessarily means viewing both the life and learning of teenagers with digital technologies in the wider context of young people's lives. This decreases the danger of overrating of the importance of digital technologies in daily life, to which technological determinism or some techno-optimistic opinions sometimes lead. At the same time, this manner of thinking represents a "defense" against the opinions that are a priori critical or that underestimate or trivialize (or even demonize) the roles of digital technologies in teenagers' lives.

The mosaic of life with digital technologies for today's young people constantly dynamically transforms and thus generates new questions and topics for research. It is not just the specific digital technologies, tools, and services that are changing, but the entire society, and the transformations include the families, schools, and out-of-school institutions as well. This is clearly shown by the situation connected to the COVID-19 pandemic, which has had a fundamental impact upon not only young people's lives with digital technologies, but also on the lives of parents, teachers, and in the end even us, the authors of this book. Therefore, we conclude our book and its final part rather non-traditionally, since the entire book was also written non-traditionally and under the completely specific conditions of the COVID-19 pandemic.

In many places in this book, we speak of the dynamics of the development of digital technologies and the related transformations of present-day society and the lives of families and young people. We focused on the transformations of schools and on the questions regarding teachers' work in the digital technology era. We completed our research approximately two months before the first case of COVID-19, was registered in the Czech Republic. As in other countries, life in the Czech Republic and therefore also the lives of families and the functioning of schools changed dramatically in the course of a few weeks. Both primary and secondary schools were (repeatedly) closed in the Czech Republic for rather long periods of time; in most cases, lessons were conducted using digital technologies. Students (especially the youngest pupils) learned from home with the help of their parents; many teachers either taught from home or went to the school and taught online from there. Life slowed down for a certain period of time; on the other hand,

digital technologies underwent huge developments. In a very short time, digital technologies became one of the main education tools and some technologies started to be used de facto overnight. Parents had to react with similar speed. Some had barely any experience with using online technologies for education or were significantly skeptical toward these technologies, as we stated in many places in our book. In addition, the students were kept at home for rather long periods of time and digital technologies became perhaps an even more important part of their everyday life than in the times before the pandemic. In some cases, digital technologies represented one of the few, if not the only, tools for communication among separated family members, such as grandparents who could not be visited in person during the "lockdown" even if they lived very close geographically. In many institutions, companies, and organizations, the situation was similar to the one in schools: over a short period of time, digital technologies became key tools for their functioning. A rather fast and radical transformation of all aspects of life occurred.

Our book describes the situation right before the outbreak of the COVID-19 pandemic, and its contents may seem hopelessly outdated now. This might be true from a certain point of view, but our book may yet be useful in many aspects. We describe the situation before the outbreak of COVID-19, so studies conducted during the pandemic or after it may compare their results to ours. Furthermore, our book describes more general trends and approaches in the field of digital technologies in wider contexts that may or may not have changed during the pandemic. In the book, we present topics such as education policy approaches and theoretical or methodological opinions that will stimulate contemplation and reflection even after the pandemic, because the pandemic will not break all connection with the times before COVID-19. Perhaps it will be interesting to watch the return to a "normal state" after the pandemic, for example in the field of the use of digital technologies in schools, and even more interesting to see what exactly the "normal state" will turn out to be. It will also be interesting to watch whether and how parents' attitudes toward ICT in the life and learning of their children will change. Early studies suggest that parents' reactions may vary widely, which is of course due to the varying experiences with how their schools dealt with this situation and the emergency remote teaching. Incidentally, studies already available in the Czech Republic show that school approaches to emergency teaching varied significantly, and nowhere near all schools were able to handle teaching using online technologies. Some of the findings we described in this book suggest the possible origins of some problems that fully manifested during the pandemic. We believe that our book will provide many topics for consideration and useful findings both during the pandemic and after it.

Recommendations

Throughout the course of our research, especially while writing this book, we have considered our results in various contexts. Our project primarily followed scientific targets as we tried to expand the expert knowledge on the topic. However, we increasingly thought about the possible practical impacts of the results of the entire project. We believe that our research offers a number of important findings related to a specific Central European country with a totalitarian past. On the other hand, the Czech Republic has been developing as an independent democratic country and part of the developed world for more than thirty years. Our research is anchored in an international context, making it possible to deduce certain recommendations for various groups of readers, not only Czechs. We are aware that digital technologies develop very quickly, and our recommendations may therefore become obsolete rather soon. It is also clear that the conditions of the use of digital technologies may differ significantly in different parts of the world, in different schools, and even in different families. However, readers may find that many aspects of life with digital technologies are similar. The lives of digital teens may also share similarities and differences. Although our research reflects some specific national characteristics, we have tried to keep our recommendations general.

Recommendations to Policymakers

We have not dedicated a separate section to policymakers in our book, but school policies and education policies are an important part of our topic. At first glance, it may seem that education policies are detached from the real lives of digital teens. Nevertheless, even in this field, visions are established and steps are taken that

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determine the general view of digital technologies in future education, particularly the manner of their use in formal education and other forms of learning. The education policy creates frameworks for the development of digital literacy, for the transformation of teaching methods and forms, and even for the impact that the online environment has on learning processes. We present the following recommendations:

- Visions and strategies for integrating digital technologies should be connected to general (international/national) educational goals, to an understanding of the penetration of digital technologies into society, to the options of digital technologies in education, to the actual condition of equipment in schools, to the pedagogical and didactic skills of teachers, to the situations in other institutions focused on educating young people, and to the knowledge of situations in families. It is necessary to set realistic and achievable goals, both with regard to equipping educational institutions with digital technologies and to the educational support of teachers and school management. The evaluation of whether the given goals were achieved and whether digital technologies contributed to desirable transformations in education plays an important role.
- Scientific findings and the results of international and comparative studies should be important sources in defining future visions, strategies, and goals, not only in the use of digital technologies in education. A complex view of the problems of education that are supported by digital technologies is very important. The use of digital technologies in classroom lessons is only one part of the lives of both teachers and students in which these technologies are used. Families, peers, and the online environment affect the use of digital technologies in education and are of great importance in the lives of teachers, parents, and digital teens. In addition, informal learning, both using and not using digital technologies, takes place both in school and outside of school. Informal learning can be of great importance in the development of digital literacy in adolescents and also in their parents and teachers.
- Curriculum in the field of digital technologies should undergo repeated revisions in response to the dynamic developments of scientific knowledge. It is not easy to alter the curriculum and it cannot be altered very often. Nevertheless, the field of digital technologies, as other fields, requires attention and updates to the curriculum.
- Exceptional equipment with digital technologies will not guarantee changes in the concept of teaching on its own. Teacher education should not focus only on digital technologies on their own; it should be a part of education focused on changes in the pedagogical thinking of teachers, for example on the transformation from teacher-centered teaching to student-centered teaching and on the related teaching methods and forms. Such an education may be provided by external courses and by mutual learning among teachers at a single school.
- It is necessary to pay appropriate attention to the preparatory education of teachers. Future teachers should encounter digital technologies regularly, both within specific subjects focused on the use of digital technologies in education and

especially in the fields they will be teaching. The European Framework for the Digital Competence of Educators (DigCompEdu) can be utilized in this matter. This also places great demands on teacher educators in digital technologies.
- Further education of teachers must respond to the didactic needs of teachers and on the development of digital technologies. The use of digital technologies directly in lessons and their integration into various methods and forms of teaching and learning, which do not have to be limited to classrooms, is very important.

Recommendations to Schools and Teachers

Teachers and school management are the key participants who introduce changes in real lives of schools. It is necessary to pay attention to the education and support of teachers and school management. In this field, there are differences among individual countries due to their historical developments, traditions, approaches to the support of schools, views on the importance of innovations, approaches to the implementation of digital technologies into education, etc. As we cannot cover all the aspects of this topic, we make the following recommendations:

- School management and school authorities and other participants in the education policy in the given region or country should seek ways to guarantee adequate and sustainable funding for purchasing new infrastructure in schools as well as for replacing obsolete digital infrastructure. Such funding should not rely on (short-term) projects; it should be guaranteed for a longer period of time.
- To an appropriate degree, online education can be a part of regular education, even in primary schools. It does not have to consist of entire lessons online or of complex online teaching environments, even though those are options. This may concern the use of some online tools in various learning situations or when working on various partial tasks within in-person learning during project lessons, etc.
- Special computer labs do not have to contribute to the development of digital literacy as much as many schools expect or expected in the past. Specialized classrooms may be fully occupied with lessons focused on digital technologies and remain unavailable for lessons in different subjects. This may be solved by using mobile technologies or a combination of personal computers and mobile technologies within a regular classroom.
- The safe and ethical use of digital technologies, not only in learning, is an important topic. Such topics transform dynamically, as do the technologies themselves. These topics should form an integral part of school education, for subjects focused on digital technologies and all other subjects.
- Prohibitions of the use of digital technologies in school or during lessons are not necessarily the best solution. Digital technologies are used commonly in almost all institutions, including schools. With prohibitions, a school separates itself from other regular institutions. With regard to the future of the students, determining clear rules for use within the school, agreed upon by teachers, students,

and parents, involving the purposeful use of digital technologies directly in lessons is a more beneficial solution than prohibition, even though this determination is often much more demanding.
- The schools, their management, and teachers should explain both to the parents and to wider public the reasons for integrating digital technologies into education or into school life. They should work with the parents and communicate with them about the problems of digital technologies. The parents could even be incorporated into some school activities in which digital technologies are used to try out or even experience what such teaching looks like.

Recommendations to Parents

For parents, our recommendations can only be very general, because the upbringing in the family is affected by a number of factors, many of which are very individual. Despite all the differences between countries, traditions, culture, and economics, international and national studies have recorded identical or similar approaches to upbringing and parental strategies in the field of digital technologies. We present the following recommendations on the basis of our research:

- The parents should talk to their children about the problems of digital technologies. Dialogue should be the foundation. Unilateral prohibitions, restrictions, or instructions aimed at children, especially without clear explanations, may result in an accumulation of misunderstandings or conflicts, or they can be completely counter-productive. On the contrary, if the children are trusted and given space, it can lead the adolescents toward thinking of the use of digital technologies, particularly in terms of the frequency and the impact of their use. Joint determinations of rules (even unwritten and informal) for the use of digital technologies that are understood and accepted by both parents and children can be the result of such dialogue.
- The parents should think of their own knowledge and skills in the field of digital technologies. There's no shame in not knowing and there's nothing wrong with asking one's children if one does not understand something in the field of digital technologies. The parental authority will not be damaged if the parents attend an educational course focused on developing knowledge and skills or using digital technologies. Such a course may help understand a lot of matters from the world of digital technologies, and it might also be useful for the parents themselves or increase their potential on the job market.
- Parents should be interested in what their children do at school. This includes communication or cooperation with the school through (online) digital technologies. The online systems that some schools use and that can help the parents with quick communication with the school are among the good examples of using digital technologies in school education.

- The time parents and children spend together may serve to prevent the negative impacts of digital technologies. If the parents fail to find such time, a certain detachment may form between them and the children. The children may choose to "escape" into the online world as one of the possible reactions to this detachment.
- Free-time activities may (or may not) be spent with digital technologies. In this case, communication between the children and parents is once again what matters. Digital technologies may for example help plan a family trip or record it on video or in photos. In the same way, activities may be performed during which digital technologies are not needed at all.

Recommendations to Teens

We find ourselves in a delicate situation at this point. Our book is not designed for adolescents, even though we are not excluding them from reading about how their peers in the Czech Republic live and how they perceive digital technologies. Nevertheless, we find ourselves in the field of family upbringing, in which giving advice and recommendations may be rather precarious. Family life and upbringing are affected by many factors, and we have focused on only some in our book. Our recommendations have to be viewed as a general perspective or just one of many possible viewpoints that may complement our recommendations for parents.

- It is good to realize that not all adults grew up at times in which the digital technologies were commonly available, including in school. They may have a different or a completely contrary view of contemporary life with these technologies and of their use. It is almost always good to try to reach an agreement with the parents/grandparents, to explain what digital technologies enable us to do and why someone might want or need to use them.
- Joint setting of rules for using digital technologies, agreed upon by parents and children together, may not necessarily represent a limitation of freedom. On the contrary, this may represent a mere setting of clear boundaries that allow the use of digital technologies without fundamental prohibitions or limitations, and also prevent meaningless conflicts.
- Digital technologies may be a good servant, but a bad master, and this is true for many fields of life, such as communicating, using social networks, playing games, learning, etc. It is always good to keep this in mind and to keep listening to others' views, whether these are the views of parents, teachers, or peers. Their opinions may contain many pieces of good advice and valuable experiences. While communicating, some people may not like it when their friends constantly look at their phones and simultaneously communicate with other people. Again: setting some rules, even informal ones, for the use of digital technologies may not be a bad idea.

- Helping parents or grandparents with digital technologies if they ask for it should go without saying, but it can also be an opportunity to show them what digital technologies can do and how they can be helpful. It is not a sign of weakness if somebody wants to use digital technologies less or in a different way than their friends. It is their right and their decision. They may have different views, approaches, or goals for their use of technology.
- Often, it might be helpful to suggest a joint family activity that includes digital technologies. This may be a way to enjoy moments together and also an opportunity to (inconspicuously) show the parents one's own knowledge and skills in the field of digital technologies. This may lead to a better understanding of the options or the purpose of digital technologies by parents, grandparents or an extended family.

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