

# Chapter 6

## Report on ICT in Education in the Czech Republic



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### 6.1 Overview of the Country

#### 6.1.1 *The Geography and History*

The Czech Republic is a small highly developed country located in central Europe. Its total area is 78,867 km<sup>2</sup> and it is the 116th largest country in the world (CIA World Factbook 2016). The country is landlocked, having a common border with Austria, Germany, Poland and Slovakia. It is strategically located astride some of the oldest and most significant land routes in Europe.

The Czech Republic includes the historical territories of Bohemia, Moravia, and Czech Silesia. Since 1 January 1993, it is an independent state. It continues in the tradition of statehood of Czechoslovakia, Czech Kingdom and Great Moravia (ninth century). The country joined NATO in 1999 and the EU in 2004. The Czech Republic has a long industrial tradition and highly decentralized administration.

#### 6.1.2 *The Population Situation*

In 2017, the Czech Republic had 10,590,000 people (5,382,000 of women, 1,617,000 children younger than 14 and 2,040,000 adults older than 65). The majority of the inhabitants of the Czech Republic are Czechs, followed by Moravians, Slovaks, Poles, Germans and Silesians. According to some estimates, there are about 250,000

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Romani people in the Czech Republic. There were 524,000 foreigners residing in the country (according to the Czech Statistical Office (CSO)) with the largest groups being Ukrainian, Slovak and Vietnamese, together with Russian, Polish and German, they formed three-quarters of foreigners residing in the country (ČSÚ 2017).

The population is linguistically homogenous, ethnic minorities are small and immigration is low. The number practising religion is the lowest in Europe. The country has an exceptionally long tradition in education attained by all social classes (EC/EACEA/EURYDICE 2009, p. 12).

The majority of the population speak Czech as their first language. As a written language, Czech dates back to the late thirteenth century. Czech is the language of instruction in all types of schools. By an Education Act, minorities are guaranteed the right to education in the learners' mother tongue. Secondary school learners can select from a larger range of modern languages. There are schools who provide instruction through a foreign language in selected subjects.

### ***6.1.3 The Political System***

The Czech Republic is a pluralist, multi-party, parliamentary democracy. The head of state is the President, elected by direct suffrage. The President and the Government exercise executive powers, while the Parliament consisting of the Chamber of Deputies and the Senate are the supreme legislative body. The territorial administration has two levels: municipalities that are basic self-government units and regions that are higher territorial self-government units. The State is denominationally neutral and the freedom of religion is granted (STUDYIN 2017).

### ***6.1.4 The Current Situation of Economic Development***

The Czech Republic has a developed, high-employment economy with a per capita Gross Domestic Product (GDP) rate that is 87% of the European Union average (World Bank, report from 2015). Most of the economy has been privatized, including the banks and telecommunications. The ambition is that also in the future, the economy will be linked mainly with industry (Iniciativa Průmysl 4.0). Good education, sufficient digital literacy, good knowledge of foreign languages, mathematics and physics and lifelong education are the necessary preconditions.

### ***6.1.5 The Status Quo of Science and Technologies***

The Czech lands have a long and rich scientific tradition. Several famous scientists were born within the current Czech Republic. Research based on cooperation between

**Table 6.1** Changes in the use of technologies in households

Households	2015 (%)	2018 (%)	Tendency
Equipped with a computer	73.1	78.4	Increase
• Desktop computer	41.9	39.9	Decrease
• Laptop	54.7	66.9	Increase
Internet access	73.1	80.5	Increase

Resource ČSÚ (2018)

universities, the Czech Academy of Sciences and specialized research centres bring new inventions and initiatives in this area.

Since the political change in 1989, education has been undergoing development. The transition progressed from the demonopolization to a qualitative diversification of educational opportunities. Recommendations for new educational policies and structures were stated in the ‘Reviews of National Policies for Education’ prepared by the Organization for Economic Cooperation and Development (OECD) in 1996.

In the Czech Republic, the number of households equipped with a computer and Internet access is stable. Tables 6.1 and 6.2 show the changes in households between 2015 and 2018. According to the Czech Statistical Office (ČSÚ 2018), 97.9% of enterprises had Internet access in 2018. Table 6.3 shows the changes between 2015 and 2018 for different technological items (Fig. 6.1).

**Table 6.2** The proportion of population using mobile devices and social networks

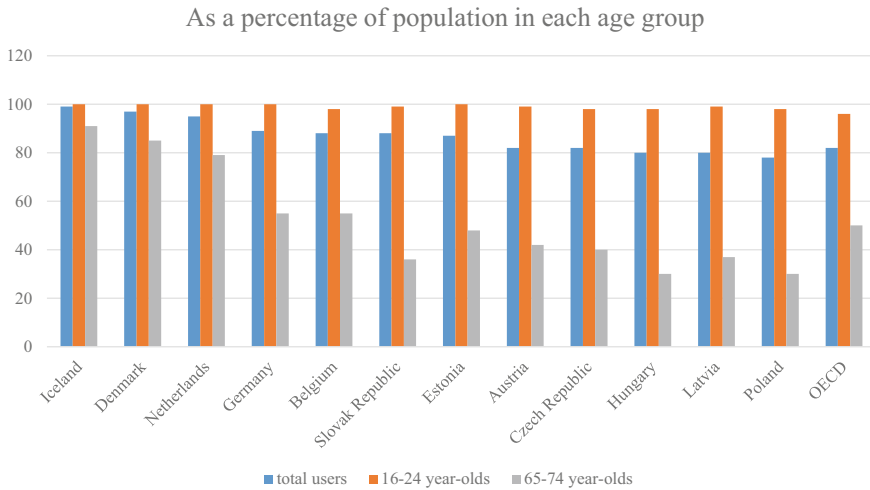
	2015 (%)	2018 (%)	Tendency
Mobile devices, whole population	75.7	80.7	Increase
• Mobile devices, population aged 16–24	77.1	93.7	Increase
• Mobile devices, population aged 65 and more	3.1	9.9	Increase
Profiles on social networks	37.4	51	Increase
E-shopping via Internet	41.9	53.9	Increase

Resource ČSÚ (2018)

**Table 6.3** Changes in the use of technologies—enterprises

	2015 (%)	2018 (%)	Tendency
High-speed Internet access (30 Mb/s and more)	19.2	35.4	Increase
Optical connection	13.3	22.9	Increase
Websites	82.8	82.8	Constant
Profiles on social networks	23.5	42.3	Increase

Resource ČSÚ (2018)



**Fig. 6.1** Internet users by age in some selected European OECD countries, especially in countries neighbouring the Czech Republic or with a similar population—in 2014. Data taken from Fig. 2.2, OECD (2016, p. 41)

### 6.1.6 Relationship with China Under the ‘16 + 1’ Cooperation Framework

The Czech Republic is involved into the initiative 16 + 1 for a multilateral platform facilitating cooperation between China and 16 Central and Eastern European countries (CEEC). There are some examples of bilateral projects realized in the Czech Republic: an important Chinese investor in the Czech Republic is the Changhong Company, a producer of TV, which opened its plant in an industrial zone in Nymburk with an investment of \$ 10 million; another example is Shanghai Maling and its meat processing plant situated in Hrobice (Vozáryová 2017).

## 6.2 Overview of the Educational Development

### 6.2.1 Education System and Policy

‘The Czech school system is based on European values, but it also has some singular aspects and it faces some challenges. Schools in the Czech Republic are administered in the framework of general administration. The responsibilities are distributed among individual layers of administration – the central government, regions (there are 14 regions) and municipalities. Regions are provided with a high degree of autonomy’ (Mazouch and Vltavská 2016, p. 5).

'In the Czech Republic, formal education in public education institutions is provided free of charge. Parents only cover part of the costs of education in the case of pre-school education in nursery schools' (Mazouch and Vltavská 2016, p. 34) (Table 6.4).

'Nursery schools (MŠ) provide pre-primary education for children usually from (two) 3 to 6 years. From the age of 5, pre-primary education is compulsory and free of charge. Otherwise, fees in public and state schools are considerably regulated' (STUDYIN 2017).

**Table 6.4** Structure of the education system in the Czech Republic

Institution	Age	Levels
Nursery school (MŠ)	(2) 3–6	ISCED 020
Basic school (ZŠ) (9 years)	6–15	
	Primary education (5 years)	6–10 ISCED 100
	Lower secondary school (4 years)	11–15 ISCED 244, EQF 1
Multi-year general secondary school (lower stage)		11/13–15 ISCED 244, EQF 1
Eight-year conservatoire	(First 4 years)	11–15 ISCED 244, EQF 1
Upper secondary school (SŠ)	Upper secondary education with Maturita examination (general) (4 years)	15–19 ISCED 344, EQF 4
	Upper secondary education with Maturita examination (vocational) (4 years)	15–19 ISCED 354, EQF 4
	Upper secondary education with vocational education and training (VET) certificate (2–3 years)	15–17/18 ISCED 353, EQF 2/3
	Upper secondary education (1–2 years)	15–16/17 ISCED 253/353, EQF 2
	Follow-up and shortened studies (1–2 years)	– ISCED 353/354, EQF 3/4
Eight-year conservatoire	Lower and upper secondary and tertiary art education (8 years)	11–19 ISCED 554, EQF 6
Six-year conservatoire	Upper secondary and tertiary art education (6 years)	15–21 ISCED 554, EQF 6
Higher education institutions (HEI)	Bachelor study (3 years)	
	Master study (2 years)	
	Ph.D. study (3–4 years)	

Resource STUDYIN (2017)

Compulsory school attendance starts at the beginning of the school year following the child's sixth birthday, unless he/she is granted a postponement. Pupils start their compulsory school attendance in the 9-year basic school (ZŠ). The elementary school in the Czech Republic includes primary and lower secondary levels of education. Upon completion of the primary level, pupils who show interest and succeed in an admission procedure may transfer to a multi-year grammar school (gymnasium) to obtain more academic education rather than the traditional lower secondary level. After completing the fifth year of the elementary school, a small number of pupils start attending 8-year conservatoires (konzervatoř) (STUDYIN 2017).

Compulsory education can take the form of individual tuition (home education) without regular attendance at a school. After written application by the legal guardian of the pupil, permission for individual tuition may be granted by the principal of school where the pupil had been accepted for compulsory education (EC/EACEA/EURYDICE 2018).

Upper secondary education (SŠ) is a multi-structured, but internally coordinated system guaranteeing education and practical vocational training. Secondary schools are divided into four types: general, technical, vocational and integrated technical/vocational. A 'maturita' (upper secondary exit exam) qualification acquired at a secondary general, technical or vocational school is regarded in law as an equivalent 'maturita' qualification. Participation rate of the 15–19 year-old students is about 90%.

Tertiary education is provided by higher education institutions (VŠ), tertiary professional schools (VOŠ) and conservatoires (konzervatoř). The minimum entrance requirement to enter the tertiary level of education is the Maturita examination certificate (STUDYIN 2017). The general aim of higher education is to provide students with adequate professional qualification, to prepare them for engagement in research and participation in lifelong learning, to assist them to contribute to the development of civic society, and international, particularly European cooperation (STUDYIN 2017).

Higher vocational schools prepare students for skilled professions requiring a post-secondary education but not university education. They offer post-secondary vocational education ending with the 'absolutorium'. Higher education institutions (HEI) provide education and studies in undergraduate (lasting 3–4 years), post-graduate (lasting 1–3 years, or 4–6 years in case of programmes not following Bachelor's degree programmes) and doctoral study programmes (lasting 3–4 years). As the highest level of the educational system, they are regarded as the culminating centres of education, independent knowledge and creative activity. They are of either a university or a non-university type, and provide accredited degree programmes as well as lifelong learning programmes. The type of higher education activity is determined by the type of available accredited degree programme.

## 6.2.2 Students and Teachers' Profiles

Most EU countries are faced with ageing of teachers and a lack of novice teachers in schools. The Czech Republic is also in a similar situation (Table 6.5).

There are no qualified teachers for primary schools in the Czech Republic, for teaching mathematics, chemistry, physics, ICT (informatics) or English. 'One of the greatest efficiency challenges in recent years to the Czech school system has been the steep decline in the school-age population. The number of 15–19 year-olds is predicted to remain over 40% lower than the 1990 numbers until 2020' (Shewbridge et al. 2016, p. 7).

There is a great interest in higher education or universities in the Czech Republic, especially in bachelor studies. The growing interest in studying at universities is due to the fact that people can enroll at any age and that universities have a fairly large offer of part-time study programmes (Tables 6.6, 6.7, 6.8 and 6.9).

**Table 6.5** Ageing and lower secondary school teachers in 2013/14

Teacher's age (years)	Czech Republic (%)	European Union (%)
Less than 30	8.5	8.6
30–39	24.9	25.0
40–49	34.6	28.3
50–59	27.2	29.5
More than 60	4.7	8.7

Resources MŠMT (2014) and Eurostat (2017)

**Table 6.6** Early childhood education (MŠ) in the Czech Republic

School year	Nursery schools	Classrooms	Pupils	Teachers
2016/17	5209	15,856	367,454	29,629
2017/18	5269	15,969	366,391	30,303

Resource ČSÚ (2018)

**Table 6.7** Compulsory education in basic school (ZŠ) in the Czech Republic

School year	Basic schools (age 6–9)	Classrooms	Pupils	Teachers
2016/17	4140	45,116	906,188	61,634.9
2017/18	4155	46,023	926,108	63,004.8

Resource ČSÚ (2018)

**Table 6.8** Secondary education (SŠ) in the Czech Republic

School year	Schools	Students	Part-time students	Secondary school education	Students			Teachers
					Secondary education ended with a vocational certificate	Secondary education ended with Maturita exam	General education	
2016/17	1308	421,535	404,087	2369	87,437	315,000	129,554	38,114.9

Resource ČSÚ (2018)

**Table 6.9** Higher education institutions (HEI) in the Czech Republic

	Year	2016	2017
HEI	Total	66	65
	Public schools	26	26
	Private schools	38	37
Faculties	Total	149	149
Students of public and private HEI (Bc, Mg, Ph.D.)	Total	311,168	299,054
	With a foreign citizenship	43,497	43,831
	Full time	236,856	227,783
	Part time and distance education	76,790	73,496
	Public schools	280,170	269,689
Private schools	31,455	29,820	
Alumni of public and private HE schools/year	Total	77,382	72,057
	Public schools	67,417	63,080
	Private schools	9968	8987

Resource ČSÚ (2018)

### 6.2.3 Expenditure on Education

In the Czech Republic, education is free, but there are some exceptions. For example, nursery schools are paid by parents and only the final year before entering basic school is free. In private schools and school facilities, the state finances non-investment expenditures related to education and training. These schools usually collect tuition fees. Education is, decisively, financed from public budgets. However, financing of regional, higher and further education differs. The operation at these schools is regulated by Education Acts. The founder of primary and lower secondary school is usually a municipality. It is responsible for current expenditure (the running costs, e.g. energy) and capital expenditure. The founder of general upper secondary school and multi-year general secondary school is usually a region (EC/EACEA/Eurydice



2014). The major source (75%) of public higher education institutions finance is granted predominantly on the basis of the per capita amounts revenue.

According to the law, private higher education institutions are obliged to secure funding for educational and creative activities. The main part of their revenue comes from tuition fees.

Further education (adult education) is financed from the state budget if it is provided in schools and if it provides education at the respective level. Otherwise, it is financed by relevant ministries, companies or the students themselves. In the case where a company organizes courses for its employees, it is obliged to bear the costs.

### **6.2.4 Education Research**

In the Czech Republic, research and development is seen as a part of a cycle resulting in innovations. The national policy of research and development is prepared in cooperation of the Ministry of Education, Youth and Sports (MEYS) and the Council for Research, Development and Innovation with other central institutions, representatives of academic community and other research organizations and institutions. Educational research covers education in and outside schools. The important scientific domains are subject didactics. Their agenda in the field of theory, practice and research covers specification and justification of subject teaching objectives, legitimization and didactical transformation of contents as well as methodological structuring of educational processes, taking into account psychological, social and other preconditions of pupils and teachers. Subject didactics are developing as autonomous interdisciplinary scientific disciplines (Stuchlíková et al. 2015).

### **6.2.5 Teachers' Professional Development**

The standard path to obtain teacher qualification is provided by universities. Most teacher education programmes are divided into Bachelor's and Master's stages. Further, some one-stage parallel master degree programmes with elements of integration primarily between theoretical and practical parts of training are offered.

Primary teachers (education for children aged in 6–11) are generalists. Teacher preparation for lower and upper secondary schools consists of one or two disciplines. Graduates of bachelor's degree study are not qualified teachers. Graduates of the master's level study are fully qualified teachers for lower and/or upper secondary schools. In the study model for teacher preparation for lower and upper secondary schools, there is considerable variety in the organization of teacher preparation programmes.

Several faculties offer pedagogical staff programmes of continuing professional education. These programmes are divided into two categories: those oriented to obtaining, addition, extension and deepening teacher qualification (not offering

an academic degree, guaranteeing the pedagogical qualification) and interest programmes (e.g. the University of the third age (U3) offering a large range of courses, not leading to pedagogical qualification).

In-service training of education staff includes study programmes for unqualified teachers resulting in formal teacher qualification, programmes resulting in other qualifications (e.g. ICT coordinator qualification) or professional development courses (in-service education). It is delivered within the lifelong learning system at higher education institutions, in establishments for in-service training of education staff or other institutions accredited by the MEYS, or this type of education can be gained through self-study. Teachers may get special allowances for acting as ICT coordinators or developing education programmes, and specific Teacher Professional Development (TPD) is required for performing these tasks.

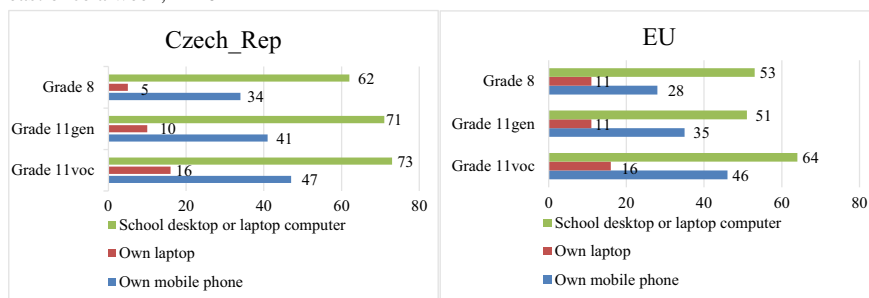
In-service teacher education is not compulsory in the Czech Republic. In the mandatory pedagogical documentation of schools, there is a 1-year school plan of in-service teacher education. Schools have in their budgets finances for covering the costs of the training. The in-service teacher education plan is the head teacher's responsibility and it is up to the head teacher to inspire their teachers to participate. In the Czech Republic, the national labour code, also applicable to teachers, requires that employers evaluate employees. School leaders as employers have a duty to evaluate the quality of teachers but are fully autonomous in determining how this takes place (EC/EACEA/Eurydice 2018).

## 6.3 New Progress of ICT in Education

### 6.3.1 Infrastructure

In 2012, according to OECD (2015, p. 18), 98.1% of 15-year-old students in the Czech Republic reported that they have a computer at home, 36.9% have even three computers at home. On average, 15-year-old students spent 122 min using the Internet outside school on weekends, while in school during the working days only 18 min. Only 47.6% students reported that they were browsing the Internet for schoolwork at least once a week, while outside of school 61.6% students. In 2012, 25.6% Czech students had used computers in mathematics lessons during the previous month. In 2012, according to OECD (2015, p. 53), the index of ICT use at school was for the Czech Republic about 0.40. 84% of the Czech 15-year-old students reported using computers in schools. They used Internet at school on average for 19 min per day. 36% of students reported that they do not use the Internet at school during a typical school day.

In 2012, during an EC survey 'students at grade 8 and 11 were asked how frequently they used various items of ICT equipment in their lessons for learning purposes' (European Schoolnet 2012, p. 10) (Table 6.10).

**Table 6.10** Percentages of Czech students using ICT equipment in their school for learning, at least once a week, in 2012

Resource European Schoolnet 2012)

**Table 6.11** ICT equipment for each pupil/student in ZŠ and SŠ

	Small ZŠ (%)	Big ZŠ (%)	SŠ + tertiary vocational schools (%)
For all school subjects	39.5	27.8	36.1
For general subjects (SŠ)	0.0	0.1	1.2
For vocational subjects (SŠ)	0.0	0.0	3.1
For selected items	40.1	60.3	54.9
Classrooms are not equipped with digital technology	20.3	11.8	4.7

Resource ČŠI (2017a, p. 12)

Currently, a relatively large number of small ZŠ<sup>1</sup> (compared to big ZŠ) do not have computer labs available to facilitate active work of all pupils on a desktop computer (ČŠI 2017a, p. 12). On the other hand, there are a large number of small ZŠ in which all teachers can use such classrooms (ČŠI 2017a, p. 12). ‘At 27.6% of ZŠ, SŠ and tertiary vocational schools, the so-called mobile classrooms (a set of laptops or tablets that are used in different classes/subjects) are available within classrooms and in teaching of various subjects’ (ČŠI 2017a, p. 12) (Table 6.11).

In Czech schools, the use of desktop computers (PC) and laptops is clearly prevalent. A low proportion of BYOD implementation into schools is related to a lack of appropriate infrastructure in schools and to a lack of capacity to administer and manage ICT resources (ČŠI 2017a, p. 19) (Table 6.12).

‘Almost all secondary and tertiary schools have classrooms where students can be actively involved in PC or other work with a digital device at the same time, and in more than half of schools it is possible to use such a classroom only for selected subjects’ (ČŠI 2017a, p. 12).

<sup>1</sup>There are significant differences in the average size of schools in the Czech Republic. Small schools have less than 50 pupils (EURYDICE 2007).

**Table 6.12** ICT resources available to pupils/students for their own active work

Type of device	MŠ (nursery schools) (%)	Small ZŠ (%)	Big ZŠ (%)
Mostly a school desktop computer/notebook	96.2	96.2	92.9
Mostly a tablet	13.9	17.6	15.0
Mostly a support for BYOD	1.6	5.9	15.2
Others	3.9	4.0	1.3

Resource ČŠI (2017a, p. 18)

**Table 6.13** Teaching staff who have a computer or tablet—proportion of schools in v %

Teachers who have a computer or tablet	MŠ (nursery schools) (%)	Small ZŠ (%)	Big ZŠ (%)	SŠ + higher vocational schools (%)
Less than 25%	64.8	23.4	11.3	12.7
From 25 to 50%	20.5	17.1	15.1	14.9
More than 50%	14.7	59.5	73.5	72.3

Resource ČŠI (2017a, p. 13)

In 85% of nursery schools, 41% of small ZŠ, 26% of big ZŠ and 28% of SŠ and tertiary professional schools about 50% teachers have no computer (or digital devices) (ČŠI 2017b, p. 3). The study done by ČŠI showed in 2017 not all teachers can use tablets, or they have not any available tablet (Table 6.13).

The findings show a very low availability of ICT resources for a teacher's work part of Czech schools of all levels. At 85.3% of nursery schools, 40.5% of small ZŠ, 26.4% of big ZŠ and 27.6% of SŠ and higher vocational schools, no other computer (or similar equipment) is available for 50% of teacher staff in their school.

Each Czech school has formulated its own ICT strategy (called ICT plan) which is constantly updated. More than 50% of teachers have their own computer or other digital device. Computers (or other appropriate devices) for pupils are upgraded no later than 7 years. Each school is adequately covered (at least 60% of classrooms) with an internal network for connecting computers or other devices (BYOD support) (ČŠI 2017c, p. 1).

The majority of large ZŠ, SŠ and tertiary professional schools use specific information systems (IS) to manage their agenda. The aggregate annual cost for information systems in schools is at least CZK 80 million.

### 6.3.1.1 Student–Computer Ratio

According to EC (2013, p. 35), in 2011–12 at grade 4 there were seven students per computer on average in the EU and for the Czech Republic six students per computer, at grade 8 five students per computer on average in the EU and for the Czech Republic

also five students per computer. At grade 11 general the student–computer ratio is 4:1 in the EU and for the Czech Republic 6:1, and at grade 11 vocational on average in the EU three students per computer and in the Czech Republic also three students.

In 2011–12, at the grade 4 there were on average in the EU 20 students per Internet connected laptop and in the Czech Republic 45 students. At the grade 8, there were on average in the EU 14 students per Internet connected laptop and in the Czech Republic 33 students. And at grade 11 on average in the EU 14 students per Internet connected laptop and in the Czech Republic 33 students.

According to OECD (2015, p. 65), a mean student–computer ratio for 15-year-old students in the Czech Republic in 2012 was 1.5 student per computer. ‘On average across OECD countries in 2012, there were five students for every school computer. Brazil, Costa Rica, Indonesia, Mexico and Turkey had the largest numbers (at least 15) of students per computer, while Australia, the Czech Republic, Macau, China, New Zealand, Norway, the Slovak Republic, the United Kingdom and the United States had fewer than two students per school computer’ (OECD 2016, p. 70).

### 6.3.1.2 ICT Coordinators in Schools

In schools, there are firstly, ICT coordinators (in 47% of small ZŠ and 87% of big ZŠ) who help teaching staff to use ICT in their work and who develop ICT strategy of school, and secondly, ICT administrators (in 18% of MŠ, 35% of ZŠ) who give a technological support to ICT users in schools. A role of ICT coordinator and his/her high performance are crucial for ICT strategy of each school and, in general, for the implementation of technology in teaching (ČŠI 2017b, p. 2). To become an ICT coordinator a teacher must be trained. 29.3% of ICT coordinators in small ZŠ and by 56.9% of ICT coordinators in big ZŠ have completed or still attend a study to become ICT coordinator (ČŠI 2017b, p. 10).

### 6.3.1.3 Connectivity of Schools

In 1996, Czech public universities and the Academy of Sciences of the Czech Republic founded the CESNET association which is working as a developer and operator of national e-infrastructure for science, research, development and education in the Czech Republic. An important part of CESNET’s activities is research of advanced network technologies and applications from hybrid networking, programmable hardware, meta-computing to middleware and video transmissions (<https://en.wikipedia.org/wiki/CESNET>). The CESNET carried on the project, eduroam, in the Czech Republic supporting mobility and roaming within the National Research and Education Networks (NREN); eduroam is used not only in Czech universities but also on many Czech schools and educational institutions. ‘A lack of large research infrastructures is addressed through the European Strategy Forum on Research Infrastructures (ESFRI) and by the MEYS Operational Programme Research and Development for Innovation (USD 1.2 billion). An e-infrastructure

**Table 6.14** Connection speed of Internet connection in ZŠ, SŠ + tertiary vocational schools (in %)

Connection speed of Internet connection	MŠ (nursery schools) (%)	Small ZŠ		Big ZŠ		SŠ + tertiary vocational schools	
		(%)	Number of pupils	(%)	Number of students	(%)	Number of students
<1 Mbps	6.0	2.1	34	0.5	219	0.6	180
1–10 Mbps	41.9	35.3	53	13.4	347	11.9	159
11–30 Mbps	31.9	39.4	63	43.0	370	33.4	262
31–100 Mbps	16.6	19.7	64	35.3	420	42.6	385
100 Mbps <	3.6	3.5	58	7.7	466	11.6	451

Resource ČŠI (2017a)

within the GÉANT network (the CESNET – Czech NREN Operator) is under development. The ICT and Strategic Services Programme encourages innovation in ICT solutions, software, and high-technology repair and data centers’ (OECD 2012, p. 274).

Currently, ‘there are still schools in the Czech Republic that are not connected to the Internet at all or that are connected by a very slow connection’ (ČŠI 2017a, p. 15) (Table 6.14).

More than 75% of SŠ and tertiary vocational schools said their students could add their own devices (such as laptops, tablets or smartphones) to school network or to the Internet at school (ČŠI 2017a, p. 17).

The governmental Digital Education Strategy (DES) strives to ensure a high-speed connection for all schools and school facilities.

### 6.3.2 Educational Resources

Educational resources play an important role in the learning process. Open educational resources can contribute to the fulfillment of the goal of open learning. The DES aims ‘to ensure publication of digital content of a wide variety of characters, supported by public funds, under Creative Commons (or otherwise) licensed to simplify access and enable them to be shared by all actors in education’ (MŠMT 2014, p. 20). The National Institute of Education (NIE) deals with a quality of digital educational resources supported from public budgets. In July 2016, the first version of criteria for defining a quality of digital educational resources was published. MEYS supports a creation of digital educational resources from public source. In 2016, there was made a proposal with criteria for assessing a quality of digital educational resources. These criteria were divided into three areas: (i) copyright requirements; (ii) technical and technological requirements and (iii) requirements for content science correctness, pedagogy and didactics (including user-friendliness).

Since 2008 digital teaching materials have been available to Czech teachers. The national learning objects repository DUM<sup>2</sup> is available through which users can search also in other linked repositories<sup>3</sup> (EDUin 2016). A number of Czech teachers gained experience with the use and creation of digital learning objects and open educational resources in EU projects involving the Czech Republic (CALIBRATE, etc.).

### **6.3.3 Learning and Teaching**

In the Czech Republic, schools use ICT also with the aim to support face-to-face teaching. Teachers create and share materials for online support using different platforms. The Moodle platform is the most popular and expanded in the Czech Republic. Cloud computing and Open-Source Software (OSS) are two phenomena which penetrate to the Czech schools, too. 'Learning management systems (LMS such as for example Moodle, Google Classroom) and cloud services (e.g. Google Apps/G Suite, Microsoft Office 365) are used less than one-fifth of small ZŠ, more than one-third of big ZŠ, and more than 60% of SŠ and tertiary vocational schools, according to principals' answers' (ČŠI 2017a, p. 19).

In some faculties of education, student teachers are trained to use different digital technology and platforms to be able to organize technology-assisted teaching. Using these experiences, they can contribute to implement innovative teaching approach in school practice.

In the Czech Republic, online learning platforms are used very often in in-service teacher education or in teacher professional development courses. However, 'across the 26 OECD countries for which data are available, 7.6% of people followed an online course, ranging from 16% in Finland down to and the lowest levels in Austria, Czech Republic and Poland' (OECD 2016, p. 106).

### **6.3.4 ICT Integration into Teaching Practice**

#### **6.3.4.1 ICT in Curriculum for Primary and Secondary Schools**

In the Czech Republic, ICT education became a compulsory subject at all levels of school education (at primary school, at lower and upper secondary schools) by the decision of MEYS in 2005, when the Framework Educational Programmes (FEPs) were introduced into schools. Nonetheless, teaching ICT subjects has focused

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<sup>2</sup>DUM. <http://dum.rvp.cz/>. Accessed 26 Apr 2019.

<sup>3</sup>Repositories for search: <http://dumy.cz/>. Accessed 26 Apr 2019, <http://www.veskole.cz/>. Accessed 26 Apr 2019, <http://www.activucitel.cz/>. Accessed 26 Apr 2019.

on developing user skills to work with computers, to use the Internet, search for information and to work with commonly available computer applications.

Currently, the NIE is preparing a revision of the FEPs which will bring radical changes in education curriculum precisely because digital literacy of pupils will be developed across all subjects and the compulsory ICT subject will be transformed into the subject of informatics (computer science or computing). These changes are in line with the DES for 2020 which the Czech government approved on 12 November 2014.

Since 2005, a compulsory subject ‘Information and communication technology’ has been a compulsory part of the curriculum for primary, lower and upper secondary schools. This subject is focused primarily on user skills to work with computers and the Internet (digital literacy). We know it is not enough; user skills to use a computer are no longer sufficient for study and work. Therefore, some ICT teachers have included step by step in ICT subject new topics from computing and computer science.

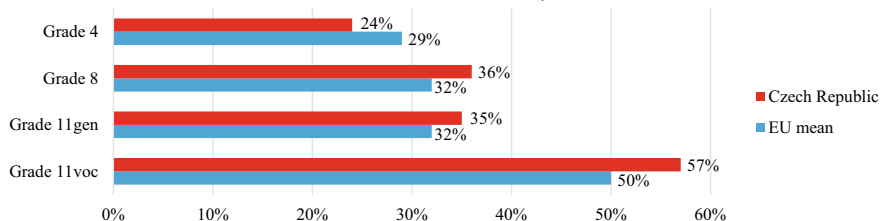
#### **6.3.4.2 ICT or Informatics Teachers**

Are there enough qualified or competent teachers in the Czech Republic to teach ICT subjects or informatics at all levels of schools? There are only 52% of teachers for teaching informatics and computing in small ZŠ, 43% in big ZŠ and about 80% in SŠ and tertiary professional schools (ČŠI 2017b, p. 3).

The ČŠI survey in 2017 shows there are not enough qualified ICT teachers for teaching of a compulsory ICT subject in ZŠ and SŠ. The ICT subject is taught on average by 1.3 teachers in each small ZŠ, 2.7 teachers in big ZŠ and 3.7 teachers in SŠ and tertiary vocational schools. 52.2% of ICT teachers in small ZŠ, 43.4% of ICT teachers in big ZŠ and 80.0% of ICT teachers in SŠ and tertiary vocational schools are qualified to teach ICT subjects (ČŠI 2017a, p. 11). According to the ČŠI survey, 60% of teachers assess their digital literacy at a higher user level, and only 21% at a basic user level, and 19% of teachers state they are able to use a wide range of digital tools (such as social networks, information systems, applications, text editors, spreadsheets, presentation programs, shared environments) and they demonstrate a high self-confidence in using the online environment’ (ČŠI 2018, p. 26).

Only 7% of teachers say that they share their own products and experiences using digital technology not only with their pupils but also with others outside school; most of them are teachers who systematically organize their Personal Learning Environments (PLEs). By contrast, two-thirds of teachers only share some of their resources with their pupils (mostly offline); most of them are teachers who do not have their PLEs. Nevertheless, there are still ‘more than 12% of teachers who do not mention using digital technologies. The highest proportion among these teachers are teachers of foreign language teachers, mathematics or geography’ (ČŠI 2018, p. 27). In the Czech schools, digital technology is very often used in subjects like ICT (99% of the hours), natural sciences and geography (91%), and foreign language and social sciences (88%). The teachers use digital technology primarily to present study content



**Table 6.15** Teachers' use of ICT in at least 25% of lessons, % of students in 2011–12

Resource European Schoolnet (2012, p. 9)

or to demonstrate working processes (69%). Less often, pupils use technology for simple activities (27%) or for complex (or creative) activities (14%), mostly in ICT lessons (59%) (ČŠI 2018, p. 23).

### 6.3.4.3 Teachers of Non-ICT Subjects

In 2012, in the Czech Republic use of ICT by teachers was similar 'to the EU average at all grades. There were more teachers using ICT in more than 25% of lessons, above the EU average, at all grades, except at grade 4. The most intense use was at grade 11 general where about one in four use ICT with their students in more than 75% of lessons' (European Schoolnet 2012, p. 9) (Table 6.15).

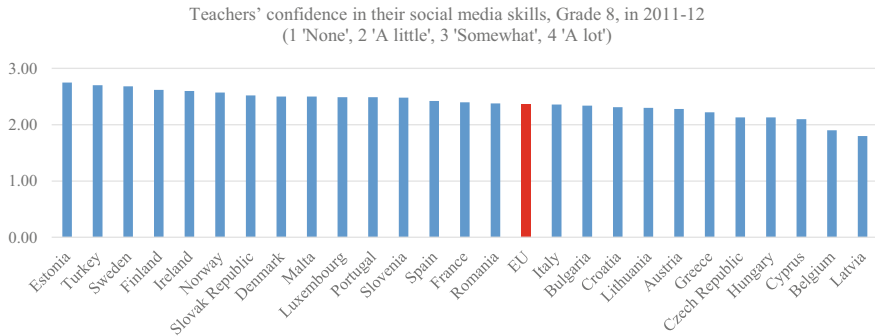
In 2012, 'at grade 8, Czech teachers were in the lowest group of countries as regards social media confidence and this was also the case at other grades' (European Schoolnet 2012, p. 13). In 2012, 'in the Czech Republic more than the EU average of students were in schools where teachers had recently undergone ICT training provided by school staff, at all grades except at grade 8 which was at the EU level. Fewer were in schools where teachers took part in training through online communities or had recently undertaken personal learning, below the EU average all grades' (European Schoolnet 2012, p. 17) (Fig. 6.2).

In 2012, at grade 8 the Czech Republic students were in the lowest group of countries as regards social media confidence close to European average (Fig. 6.3).

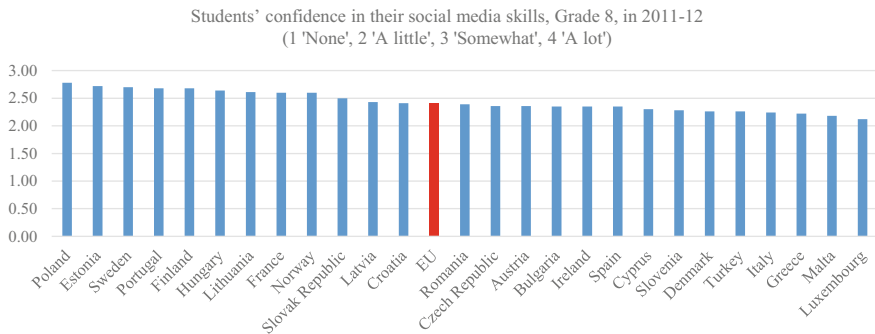
According to OECD (2016), in 2012, Czech primary and secondary school teachers have shown relatively a good level of ICT and problem-solving skills (Fig. 6.4).

### 6.3.4.4 Students' Ability to Use ICT to Create Digital Outcomes and to Solve Problems

In schools, students very often create different digital products (artefacts): a digital creative production is a typical component of digital literacy. ČŠI (2018) found that 'in 47% of lessons students do some digital products. Very often (in 97% of lessons)



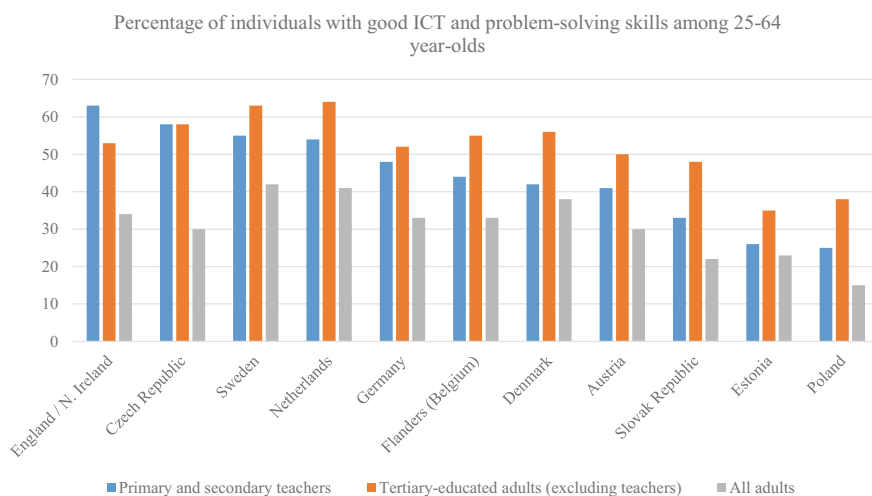
**Fig. 6.2** Teachers' confidence in their social media skills, grade 8, in 2011–12. *Resource* European Schoolnet (2012)



**Fig. 6.3** Students' confidence in their social media skills, grade 8, in 2011–12. *Resource* European Schoolnet (2012)

a created product has a visual form (e.g., image, text, graph, diagram, table, movie, animation), much less often it is an acoustic product (sounds, narration, music, etc.), or others'.

In the Czech Republic, schools support pupils and students to participate in the Informatics Beaver competition ([ibobr.cz](http://ibobr.cz)) which has a great impact on pupils' and students' computational thinking development. It is an excellent and effective approach to engaging young people to develop their algorithmic and logical thinking and ability to design strategies to solve computational problems (OECD 2016, p. 59). The requirement to develop pupils' skills to solve ICT problems has not been particularly emphasized in the Czech school curriculum. As indicated above, the revised curriculum FEPs in the Czech Republic will implement the concept of digital literacy in accordance to the Digital Competence Framework 2.0 developed by the EC JRC (Vuorikari et al. 2016) in which problem-solving with ICT is one of five key components of digital competence.



**Fig. 6.4** ICT skills among primary and secondary teachers, other tertiary educated adults and the overall adult population in some European countries, in 2012. *Resource* OECD (2016)

### 6.3.4.5 Factors Influencing the State of Use of ICT in Schools

There are many reasons why we cannot be satisfied with the use of ICT and ICT teaching at schools. In Table 6.16, there are key factors that effect on using ICT in teaching practice in Czech schools.

The state of ICT use in schools is monitored and evaluated by the Czech School Inspectorate (ČŠI). During the school year 2016/2017, through an online questionnaire to head teachers of all schools (nursery schools, primary, secondary and tertiary professional schools), the ČŠI collected data about using digital technology in schools. It was found that ‘the use of digital technologies in nursery schools (MŠ) has a specific character. Nursery schools (MŠ), as opposed to basic schools (ZŠ) and secondary schools (SŠ) do not carry out education in a specialized field of study (ICT); digital technology serves as one of a complementary form in pre-school education and is designed primarily for management and communication, and also as a tool for teaching staff’ (ČŠI 2017a, p. 4).

To assess the integration of ICT into a school life, a diffusion model of ‘integration of modern technologies into teaching’ was proposed. This model describes ‘the level of incorporation of ICT into school performance in five areas: (1) Management and planning; (2) ICT in school curriculum; (3) Professional development; (4) Integration of ICT into school life; and (5) ICT infrastructure. The individual areas are described in a total of 29 indicators’ (ČŠI 2015, p. 6). Assessing of a level of ICT development of school by the ČŠI is based on school documents, including self-assessment, the school ICT strategy development and interviews with school staff (principal, ICT coordinator, teachers).

**Table 6.16** Factors that prevent teachers from using ICT more intensively in their teaching

Factors	Small ZŠ (%)	Big ZŠ (%)	SŠ + tertiary vocational schools (%)
Lack of time	31.4	34.7	29.7
Insufficient ICT equipment	46.0	53.7	45.8
Insufficient knowledge of ICT	20.5	36.4	28.5
Problems in organizing teaching	26.5	32.1	26.3
Problems in linking ICT and curriculum	5.9	9.3	14.1
Negative attitude towards the inclusion of ICT in education	5.8	13.6	12.2
Poor prior experience with the use of ICT in teaching	3.2	7.7	7.7
Concerns about ICT and lack of self-confidence	10.5	28.4	20.5
Another reasons	8.6	8.3	8.4
Teacher do not see any obstacles	22.3	12.5	18.8

Resource ČŠI (2017a, p. 20)

The ČŠI has been monitoring and evaluating the status of ICT in schools for several years using the following indicators for identifying the ICT level of schools. These indicators ‘really influence the assessment of the conditions for the use of digital technologies in education’ (ČŠI 2017a, p. 21):

- updated school ICT strategy development;
- ICT administrator in the school;
- ensuring that more than 50% of teachers have their own computer or other devices in the school;
- upgrade of computers (or other appropriate devices) for pupils (at the latest after 7 years) and
- The school is adequately covered (at least 60% of classrooms) with a local network for connecting computers or other devices (BYOD support).

A school meeting these parameters has an up-to-date ICT service and development strategy, which is ensured by a qualified employee who is also responsible for comprehensive management, security and other requirements well in advance.

### 6.3.4.6 Indicators for Evaluating Students and Teachers in ICT Literacy Development

ČŠI has specified indicators of ICT literacy or digital literacy development. In accordance with Ferrari (2013), the following indicators have been defined for the assessment of the progress of pupil's digital literacy development: (1) information processing, (2) digital content creation, (3) working with digital technologies, (4) security and ethical behaviour in a digital environment, (5) solving problems, (6) communication and collaboration and (7) personal learning environment of pupils and teachers. The ČŠI monitors these indicators in schools, using observation methods of the activities in the classroom, evaluating the materials used, evaluating pupils' outputs, evaluating the digital technologies used, analysing school rules, regulations and orders, student work, interviewing teachers, pupils, ICT coordinators, analysis of the training organization, portfolio analysis, etc. (ČŠI 2015).

## 6.4 Policy and Strategy of ICT

The DES focuses on three cross-cutting priorities: (1) reducing inequalities in education, (2) promoting quality teaching and teaching as a key assumption and (3) managing the education system responsibly and effectively. Its main goal is to set the conditions and processes in education that will enable to realize digital education. It encompasses both education that effectively uses digital technology to support teaching and learning and education that develops pupils' digital literacy and prepares them for application in society and in a labour market, where knowledge and skills requirements in the information technology segment are still growing.

The DES emphasizes the concept of open learning. The Czech government is striving to 'build an open environment that will enable every individual, without any difference and without obstacles, to learn for life. Such learning by using available digital technologies and encouraging individuals to use them will increasingly be perceived as an activity without any link to a specific place and time' (MŠMT 2014, p. 11). Digital literacy development in schools will follow the DigComp concept defined in EU documents (see Ferrari 2012, 2013). In schools of all levels, including pre-school education, attention will be paid to computational thinking development of pupils and their teachers. The DES aims to meet these three priority objectives: (i) to open education to new methods and ways of learning through and with digital technologies, (ii) to improve pupils' competencies to use information and to work with digital technology and (iii) to develop pupils' computational thinking. A great deal of attention will be paid to digital literacy being developed in all subjects across the curriculum. The development of digital literacy and computational thinking will also focus on education of children in nursery schools.

### ***6.4.1 Policies-Related Educational Informationalization in Recent Years***

Since October 2017, in a frame of the 3-years project, «PRIM» ([www.imysleni.cz](http://www.imysleni.cz)), nine Czech faculties of education have been working closely together to develop and validate teaching materials, guidelines for teaching a new subject of Informatics and for validating these at several selected schools (starting with pre-school centres ending with secondary schools). At the same time, courses and subjects for teachers of MŠ, ZŠ and SŠ are being prepared to be ready for the planned curricular changes. All nine faculties of education must innovate study programmes for student teachers of all subjects including ICT and Computer Science. Moreover, since January 2018, all nine faculties have been collaborating on another 3-year project «DG: Support for the development of digital literacy» (<http://pages.pedf.cuni.cz/digitalni-gramotnost/>). Both projects, «PRIM» and «DG: Support for the development of digital literacy», should define conditions, design materials and verify new methodological approaches to make DES a reality in schools.

### ***6.4.2 ICT Financing Resource***

‘Financing of schools starts from a normative basis (i.e., the number of pupils is significant) and is combined with programme financing (developmental programmes). Universities are also financed on a normative basis, but at the present time the influence of qualitative criteria in the process of financing is increasing. Universities get financial means for the instruction of students from the MEYS’ (Mazouch and Vltavská 2016, p. 38). According to EUROSTAT (2017, p. 59), the Czech Republic’s public expenditure on tertiary education relative to GDP in 2014 achieved 0.8%.

In 2012, ‘the Ministry of Education allocates an overall amount for teaching, and other educational costs as well as for school services (in-service training of educational staff, special interest and leisure time activities of pupils, guidance, meals and accommodation and activities connected with school development) to regional authorities. Regional authorities then distribute resources to schools according to the number of pupils and their regional per capita amount’ (EACEA P9 Eurydice 2012, p. 58).

‘In the Czech Republic, the Ministry of Education (after negotiations with public HEIs) sets the limit on the number of students who are to be funded from the state budget. Public HEIs may admit more students but they have to fund them from their own resources, as they cannot charge students tuition fees for studying in a degree programme in the Czech language unless the length of studies exceeds the standard length by more than one year. Tertiary professional schools in the Czech Republic, providing programmes at level ISCED 5B, have fixed capacity of students which is based on the limits set by the relevant regional authority which is in charge of

governance of tertiary professional education within the given region' (EACEA P9 Eurydice 2012, p. 61).

In the Czech Republic, 'the transfer of resources for teaching staff involves both the national administrations (top level) and their regional (intermediate level) authorities' (EC/EACEA/EURYDICE 2014, p. 15).

'In a majority of EU countries, central/top level ministries use a funding formula to establish the level of resources for operational goods and services. As is the case for teaching staff, a funding formula is the method most commonly used by the responsible ministries to determine the level of resources for operational goods and services, regardless of the type of funding (grants or lumps sums) and whether it is intended to cover all or only some of the costs involved' (EC/EACEA/EURYDICE 2014, p. 28). The Czech Republic belongs to three countries which use a method different to the one used for determining the level of teaching staff resources.

'The school system is principally financed from public budgets. Nevertheless, financial flows in the regional school system (including schools from nursery schools to higher vocational schools and school facilities; this is regulated by the Education Act), university system and further education are different' (Mazouch and Vltavská 2016, p. 30).

'According to Education at a Glance 2014, the overall level of educational funding is comparatively low in the Czech Republic: Total expenditure (public and private) on all levels of education in the Czech Republic is 5.0% of GDP (6.1% on average in the OECD); public expenditures on primary, secondary and post-secondary non-tertiary education is 2.6% of GDP (3.6% on average in the OECD; 3.5% on average in the EU21 countries)' (Mazouch and Vltavská 2016, p. 30).

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